9-1005-286-20-2

TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE MANUAL FOR

GUN, AIR DEFENSE ARTILLERY, TOWED: 20-MM, M167A1 CANNON M168, GUN CARRIAGE M42A1, SIGHT M61, AND RADAR AN/VPS-2 (NSN 1005-01- 014-0837)

General Electric Company
Contract No. DAAA09-76-C-2002

This copy is a reprint which includes current pages from Changes 1 through 4.

This manual supersedes TM 9-1005-286-20-2, 30 October 1974, including all changes.

NOTE

Retain TM 9-1005-286-20-2, 30 October 1974, for use until conversion of M167 to M167A1 configuration has been accomplished.

MARCH 1978

D101.11:

best copy available

TM 9-1005-286-20-2
C4

CHANGE

NO. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC 17 November 1988

Organizational Maintenance Manual

For

GUN, AIR DEFENSE ARTILLERY, TOWED:
20-MM, M167A1
CANNON M168, GUN CARRIAGE M42A1,
SIGHT M61, AND RADAR AN/VPS-2
(NSN 1005-01-014-0837)

TM 9-1005-286-20-2, 18 March 1978, is changed as follows:

1. New or changed material is indicated by a vertical bar in the margin of the page.

2. Remove old pages and insert new pages as indicated below.

Remove Pages	*Insert Pages*
i and ii	i and ii
1-99 and 1-100	1-99 and 1-100
1-101/(1-102 blank)	1-101/(1-102 blank)
1-103 and 1-104	1-103/(1-104 blank)
1-105 and 1-106	1-105/(1-106 blank)
1-107/(1-108 blank)	1-107/(1-108 blank)
None	1-108.1 and 1-108.2

3. File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

WILLIAM J. MEEHAN II
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-40, Unit Maintenance requirements for Gun, Air Defense Artillery, Towed, 20-MM, M167A1.

TM 9-1005-286-20-2
C3

CHANGE
NO. 3

HEADQUARTERS,
DEPARTMENT OF THE ARMY
Washington, D.C.,
12 September 1985

Organizational Maintenance Manual

For

GUN, AIR DEFENSE ARTILLERY, TOWED:
20-MM, M167A1
CANNON M168, GUN CARRIAGE M42A1, SIGHT M61,
AND RADAR AN/VPS-2
(NSN 1005-01-014-0837)

TM 9-1005-286-20-2, 18 March 1978, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. New or changed material is indicated by a vertical bar in the margin of the page.
3. Revised illustrations are indicated by a vertical bar adjacent to the illustration identification number, and shaded lines in the affected areas. Added illustrations are indicated by shaded lines around the entire new figure.

Remove Pages	Insert Pages
A/(B blank)	None
i and ii	i and ii
1-3/(1-4 blank) through 1-5/(1-6 blank)	1-3/(1-4 blank) through 1-5/(1-6 blank)
1-11/(1-12 blank) through 1-13/(1-14 blank)	1-11/(1-12 blank) through 1-13/(1-14 blank)
1-17/(1-18 blank) through 1-21/(1-22 blank)	1-17/(1-18 blank) through 1-21/(1-22 blank)
1-25/(1-26 blank) through 1-31/(1-32 blank)	1-25/(1-26 blank) through 1-31/(1-32 blank)
1-35/(1-36 blank) through 1-39/(1-40 blank)	1-35/(1-36 blank) through 1-39/(1-40 blank)
1-45/(1-46 blank)	1-45/(1-46 blank)
1-51/(1-52 blank)	1-51/(1-52 blank)
1-65/(1-66 blank)	1-65/(1-66 blank)
1-69/(1-70 blank)	1-69/(1-70 blank)
1-77 and 1-78	1-77 and 1-78
1-87/(1-88 blank)	1-87/(1-88 blank)
1-93/(1-94 blank) through 1-95/(1-96 blank)	1-93/(1-94 blank) through 1-95/(1-96 blank)
1-105 and 1-106	1-105 and 1-106
1-109/(1-110 blank) through 1-113/(1-114 blank)	1-109/(1-110 blank) through 1-113/(1-114 blank)
1-119/(1-120 blank) through 1-121/(1-122 blank)	1-119/(1-120 blank) through 1-121/(1-122 blank)
1-129/(1-130 blank)	1-129/(1-130 blank)
1-133/(1-134 blank) through 1-135/(1-136 blank)	1-133/(1-134 blank) through 1-135/(1-136 blank)
1-141/(1-142 blank)	1-141/(1-142 blank)
1-151/(1-152 blank) through 1-153/(1-154 blank)	1-151/(1-152 blank) through 1-153/(1-154 blank)
1-157/(1-158 blank) through 1-159/(1-160 blank)	1-157/(1-158 blank) through 1-159/(1-160 blank)
1-167/(1-168 blank)	1-167/(1-168 blank)
1-171/(1-172 blank) through 1-173/(1-174 blank)	1-171/(1-172 blank) through 1-173/(1-174 blank)
1-179/(1-180 blank)	1-179/(1-180 blank)
1-183/(1-184 blank) through 1-193/(1-194 blank)	1-183/(1-184 blank) through 1-193/(1-194 blank)

4. File this change sheet in front of this publication for reference purposes.

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

DONALD J. DELANDRO
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-40, Organizational Maintenance requirements for Gun, Air Defense Artillery, Towed, 20-MM, M167A1.

CHANGE
NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC., *15 March 1983*

Organizational Maintenance Manual

For

**GUN, AIR DEFENSE ARTILLERY, TOWED:
20-MM, M167A1
CANNON M168, GUN CARRIAGE M42A1
AND SIGHT M61 AND RADAR AN/VPS-2
(NSN 1005-01-014-0837)**

TM 9-1005-286-20-2, 18 March 1977, is changed as follows:

1. Remove old pages and insert new pages as indicated below. Added or revised illustrations are indicated by a vertical bar adjacent to the illustration identification number, and shaded lines in the affected areas.

Remove Pages	Insert Pages
A/(B blank)	A/(B blank)
1-47/(1-48 blank)	1-47/(1-48 blank)
1-123/(1-124 blank)	1-123/(1-124 blank)
1-145/(1-146 blank)	1-145/(1-146 blank)
1-169/(1-170 blank)	1-169/(1-170 blank)

2. File this change sheet in front of this publication for reference purposes.

TM 9-1005-286-20-2
C 2

By Order of the Secretary of the Army:

E.C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-40, Organizational Maintenance requirements for Gun, Anti Aircraft Artillery Towed: M167A1.

CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 27 November 1981

ORGANIZATIONAL MAINTENANCE MANUAL

FOR

GUN, AIR DEFENSE ARTILLERY, TOWED:
20-MM, M167A1
CANNON M168, GUN CARRIAGE M42A1, SIGHT M61,
AND RADAR AN/VPS-2

(NSN 1005-01-014-0837)

TM 9-1005-286-20-2, 18 March 1978, is changed as follows:

1. Remove old pages and insert new pages as indicated below.

2. New or changed material is indicated by a shaded box around the changed area.

3. File this change sheet in front of the publication for reference purposes.

Remove pages	Insert pages
1-3 (1-4 blank) through 1-7 (1-8 blank)	1-3 (1-4 blank) through 1-7 (1-8 blank)
1-11 (1-12 blank and 1-13 (1-14 blank)	1-11 (1-12 blank) and 1-13 (1-14 blank)
1-17 (1-18 blank) through 1-23 (1-24 blank)	1-17 (1-18 blank) through 1-23 (1-24 blank)
1-27 (1-28 blank) and 1-29 (1-30 blank)	1-27 (1-28 blank) and 1-29 (1-30 blank)
1-35 (1-36 blank)	1-35 (1-36 blank)
1-59 (1-60 blank) and 1-61 (1-62 blank)	1-59 (1-60 blank) and 1-61 (1-62 blank)
1-91 (1-92 blank)	1-91 (1-92 blank)
1-95 (1-96 blank)	1-95 (1-96 blank)
1-119 (1-120 blank) and 1-121 (1-122 blank)	1-119 (1-120 blank) and 1-121 (1-122 blank)
1-135 (1-136 blank)	1-135 (1-136 blank)
1-139 (1-140 blank)	1-139 (1-140 blank)
1-153 (1-154 blank) and 1-155 (1-156 blank)	1-153 (1-154 blank) and 1-155 (1-156 blank)
1-173 (1-174 blank)	1-173 (1-174 blank)
1-179 (1-180 blank) and 1-181 (1-182 blank)	1-179 (1-180 blank) and 1-181 (1-182 blank)
1-185 (1-186 blank)	1-185 (1-186 blank)
1-189 (1-190 blank)	1-189 (1-190 blank)
1-193 (1-194 blank)	1-193 (1-194 blank)

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Brigadier General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-40, Organizational maintenance requirements for Gun Antiaircraft Artillery Towed 20MM, XM 167.

Technical Manual

TM 9-1005-286-20-2

HEADQUARTERS,
DEPARTMENT OF THE ARMY
Washington, D.C., 18 March 1978

Organizational Maintenance Manual

for

GUN, AIR DEFENSE ARTILLERY, TOWED:

20-MM, M167A1

CANNON M168, GUN CARRIAGE M42A1, SIGHT M61,

AND RADAR AN/VPS-2

(NSN 1005-01-014-0837)

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in back of the manual and mailing the form direct to Commander, US Army Armament, Munitions and Chemical Command, Attn: AMSMC-MAS, Rock Island, IL 61299-6000. A reply will be furnished directly to you.

NOTE

This manual consists of two volumes: TM 9-1005-286-20-1 and TM 9-1005-286-20-2. This volume contains all applicable functional, schematic, and wiring diagrams. All other material is contained in TM 9-1005-286-20-1.

*This manual supersedes TM 9-1005-286-20-2, 30 Oct 74, including changes.

LIST OF SCHEMATICS

Number	*Title*	*Page*
S-1	M167A1 system overall simplified block diagram	1-1
S-2	Cannon control and firing circuits schematic diagram	1-3
S-3	Cannon control and firing circuits functional diagram	1-5
S-4	Gun clearing circuits functional diagram	1-7
S-5	Mount system block diagram	1-9
S-6	Mount elevation control functional diagram	1-11
S-7	Mount azimuth control functional diagram	1-13
S-8	Sight magnet current circuits simplified block diagram	1-15
S-9	Sight magnet current circuits functional diagram	1-17
S-10	Sight torque current circuits simplified block diagram	1-19
S-11	Sight torque current circuits functional diagram	1-21
S-12	Ten-second time delay circuit functional diagram	1-23
S-13	Acquisition time delay circuit functional diagram	1-25
S-14	Ready-to-fire circuit functional diagram	1-27
S-15	External range control circuit functional diagram	1-29
S-16	Mode scaling functional diagram	1-31
S-17	Electronic countermeasure detection circuit functional diagram	1-33
S-18	Self test circuit functional diagram	1-35
S-19	Low voltage protection circuit functional diagram	1-37
S-20	Radar set AN/VPS-2 functional block diagram	1-39
S-21	Synchronizing system functional block diagram	1-39
S-22	Synchronizing system timing diagram	!-41
S-23	Transmitting system functional block diagram	1-43
S-24	RF system functional block diagram	1-45
S-25	Receiving system functional block diagram	1-47
S-26	Sum and difference gate signals waveform diagram	1-49
S-27	Output of sum and difference gates waveform diagram	1-49
S-28	Ranging system functional block diagram (sheet 1 of 2)	1-51
S-28	Ranging system functional block diagram (sheet 2 of 2)	1-53
S-29	Elevation servo drive functional block diagram	1-55
S-30	Traverse servo drive functional block diagram	1-57
S-31	Radar power system functional block diagram	1-59
S-32	Radar configuration for clutter lock-on-functional block diagram	1-61
S-33	Radar configuration for midrange calibration functional block diagram	1-61
S-34	Sight mechanism diagram	1-63
S-35	Sight and radar interface functional diagram	1-65
S-36	Battery charging circuit functional diagram	1-67
S-37	System simplified interconnection diagram	1-69
S-38	Detailed interconnection diagram (sheet 1 of 18)	1-71
S-38	Detailed interconnection diagram (sheet 2 of 18)	1-72
S-38	Detailed interconnection diagram (sheet 3 of 18)	1-73
S-38	Detailed interconnection diagram (sheet 4 of 18)	1-74
S-38	Detailed interconnection diagram (sheet 5 of 18)	1-75
S-38	Detailed interconnection diagram (sheet 6 of 18)	1-76
S-38	Detailed interconnection diagram (sheet 7 of 18)	1-77
S-38	Detailed interconnection diagram (sheet 8 of 18)	1-78

LIST OF SCHEMATICS (Continued)

Number	Title	Page
S-38	Detailed interconnection diagram (sheet 9 of 18)	1-79
S-38	Detailed interconnection diagram (sheet 10 of 18)	1-81
S-38	Detailed interconnection diagram (sheet 11 of 18)	1-83
S-38	Detailed interconnection diagram (sheet 12 of 18)	1-85
S-38	Detailed interconnection diagram (sheet 13 of 18)	1-87
S-38	Detailed interconnection diagram (sheet 14 of 18)	1-89
S-38	Detailed interconnection diagram (sheet 15 of 18)	1-91
S-38	Detailed interconnection diagram (sheet 16 of 18)	1-93
S-38	Detailed interconnection diagram (sheet 17 of 18)	1-95
S-38	Detailed interconnection diagram (sheet 18 of 18)	1-97
S-39	Cable assembly W1 wiring diagram	1-99
S-40	Cable assembly W2 wiring diagram	1-99
S-41	Cable assembly W3 wiring diagram	1-99
S-42	Cable assembly W4 wiring diagram	1-99
S-43	Cable assembly W5 wiring diagram	1-100
S-44	Cable assembly W6 and shorting connector wiring diagram	1-100
S-45	Cable assembly W7 wiring diagram	1-100
S-46	Cable assembly W8 wiring diagram	1-101
S-47	Cable assembly W9 wiring diagram	1-103
S-48	Cable assembly W10 wiring diagram	1-103
S-49	Cable assembly W11A wiring diagram	1-103
S-50	Cable assembly W12 wiring diagram	1-105
S-51	Cable assembly W13 wiring diagram	1-105
S-52	Cable assembly W14 wiring diagram	1-105
S-53	Cable assembly W15 wiring diagram	1-105
S-54	Cable assembly W16 wiring diagram	1-105
S-55	Cable assembly W17 wiring diagram	1-105
S-56	Cable assembly W18 wiring diagram	1-105
S-57	Cable assembly W101 wiring diagram	1-107
S-58	Cable assembly W102 wiring diagram	1-107
S-59	Cable assembly W103 wiring diagram	1-107
S-60	Cable assembly W104 wiring diagram	1-108.1
S-61	Cable assembly W105 wiring diagram	1-108.1
S-62	Cable assembly W106 wiring diagram	1-108.1
S-63	Cable assembly W107 wiring diagram	1-108.1
S-64	Cable assembly W108 wiring diagram	1-108.2
S-65	Cable routing (sheet 1 of 5)	1-108.2
S-65	Cable routing (sheet 2 of 5)	1-109
S-65	Cable routing (sheet 3 of 5)	1-111
S-65	Cable routing (sheet 4 of 5)	1-113

LIST OF SCHEMATICS (Continued)

Number	Title	Page
S-65	Cable routing (sheet 5 of 5)	1-115
S-66	Taillight stoplight schematic diagram	1-117
S-67	Radar set AN/VPS-2 simplified functional schematic (sheet 1 of 4)	1-119
S-67	Radar set AN/VPS-2 simplified functional schematic (sheet 2 of 4)	1-121
S-67	Radar set AN/VPS-2 simplified functional schematic (sheet 3 of 4)	1-123
S-67	Radar set AN/VPS-2 simplified functional schematic (sheet 4 of 4)	1-125
S-68	Radar 6.5-volt and 5-volt power distribution functional schematic diagram (sheet 1 of 2)	1-127
S-68	Radar 6.5-volt and 5-volt power distribution functional schematic diagram (sheet 2 of 2)	1-129
S-69	Radar 23-volt and 15-volt power distribution functional schematic diagram (sheet 1 of 2)	1-131
S-69	Radar 23-volt and 15-volt power distribution functional schematic diagram (sheet 2 of 2)	1-133
S-70	Radar 24-volt power distribution functional schematic diagram (sheet 1 of 2)	1-135
S-70	Radar 24-volt power distribution functional schematic diagram (sheet 2 of 2)	1-137
S-71	Radar 28-volt power distribution functional schematic diagram (sheet 1 of 2)	1-139
S-71	Radar 28-volt power distribution functional schematic diagram (sheet 2 of 2)	1-141
S-72	Radar 33-volt and 25-volt power distribution functional schematic diagram (sheet 1 of 2)	1-143
S-72	Radar 33-volt and 25-volt power distribution functional schematic diagram (sheet 2 of 2)	1-145
S-73	Radar antenna positioning system functional schematic diagram (sheet 1 of 2)	1-147
S-73	Radar antenna positioning system functional schematic diagram (sheet 2 of 2)	1-149
S-74	Radar synchronizing system functional schematic diagram (sheet 1 of 2)	1-151
S-74	Radar synchronizing system functional schematic diagram (sheet 2 of 2)	1-153
S-75	Radar transmitting system functional schematic diagram (sheet 1 of 2)	1-155
S-75	Radar transmitting system functional schematic diagram (sheet 2 of 2)	1-157
S-76	RF system functional schematic diagram (sheet 1 of 2)	1-159
S-76	RF system functional schematic diagram (sheet 2 of 2)	1-161
S-77	Radar receiving system functional schematic diagram (sheet 1 of 4)	1-163
S-77	Radar receiving system functional schematic diagram (sheet 2 of 4)	1-165
S-77	Radar receiving system functional schematic diagram (sheet 3 of 4)	1-167
S-77	Radar receiving system functional schematic diagram (sheet 4 of 4)	1-169
S-78	Radar ranging system functional schematic diagram (sheet 1 of 6)	1-171
S-78	Radar ranging system functional schematic diagram (sheet 2 of 6)	1-173
S-78	Radar ranging system functional schematic diagram (sheet 3 of 6)	1-175
S-78	Radar ranging system functional schematic diagram (sheet 4 of 6)	1-177
S-78	Radar ranging system functional schematic diagram (sheet 5 of 6)	1-179
S-78	Radar ranging system functional schematic diagram (sheet 6 of 6)	1-181
S-79	M167A1 system electrical schematic diagram (sheet 1 of 5)	1-183
S-79	M167A1 system electrical schematic diagram (sheet 2 of 5)	1-185
S-79	M167A1 system electrical schematic diagram (sheet 3 of 5)	1-187
S-79	M167A1 system electrical schematic diagram (sheet 4 of 5)	1-189
S-79	M167A1 system electrical schematic diagram (sheet 5 of 5)	1-191
S-80	M167A1 interconnection schematic	1-193

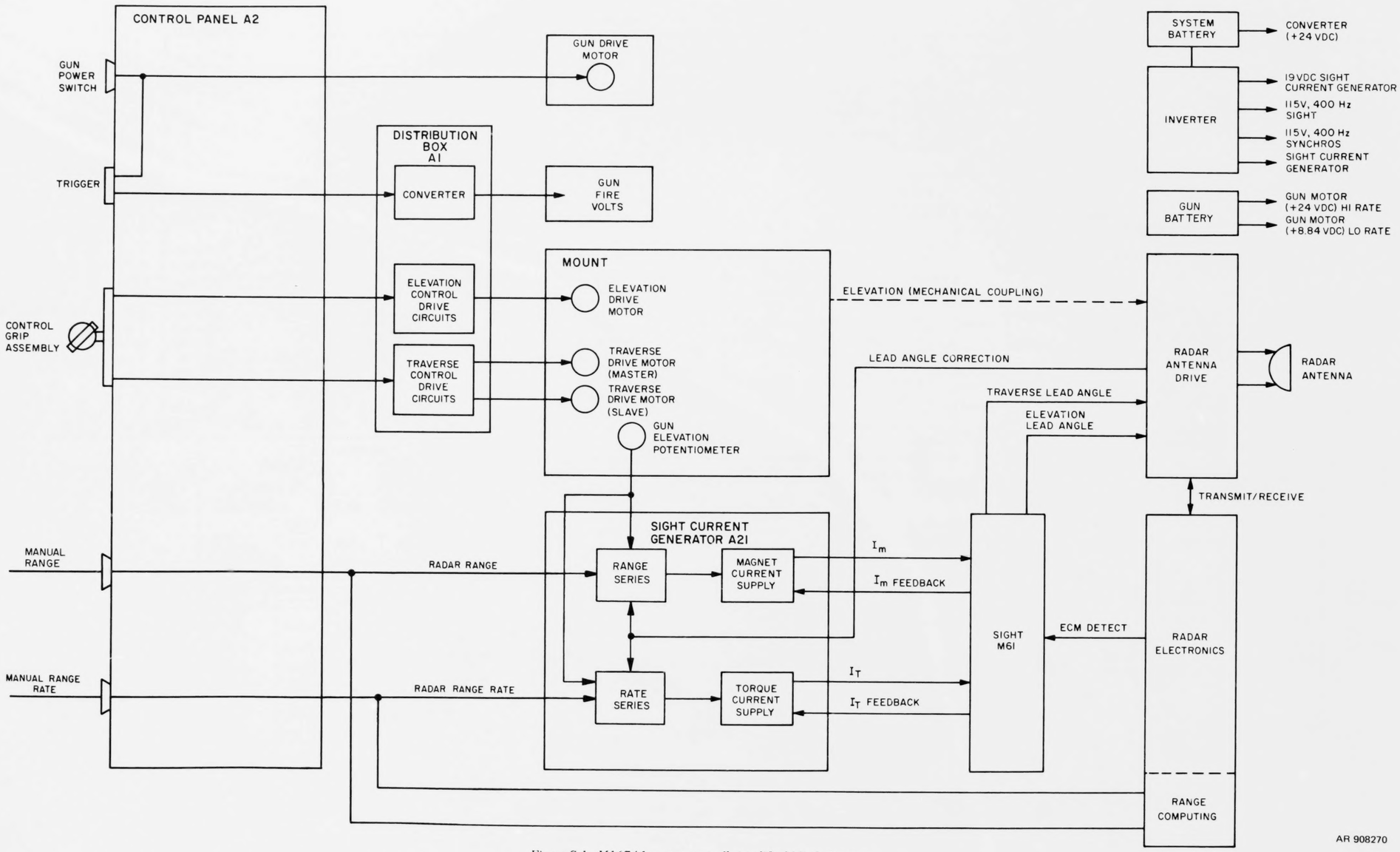
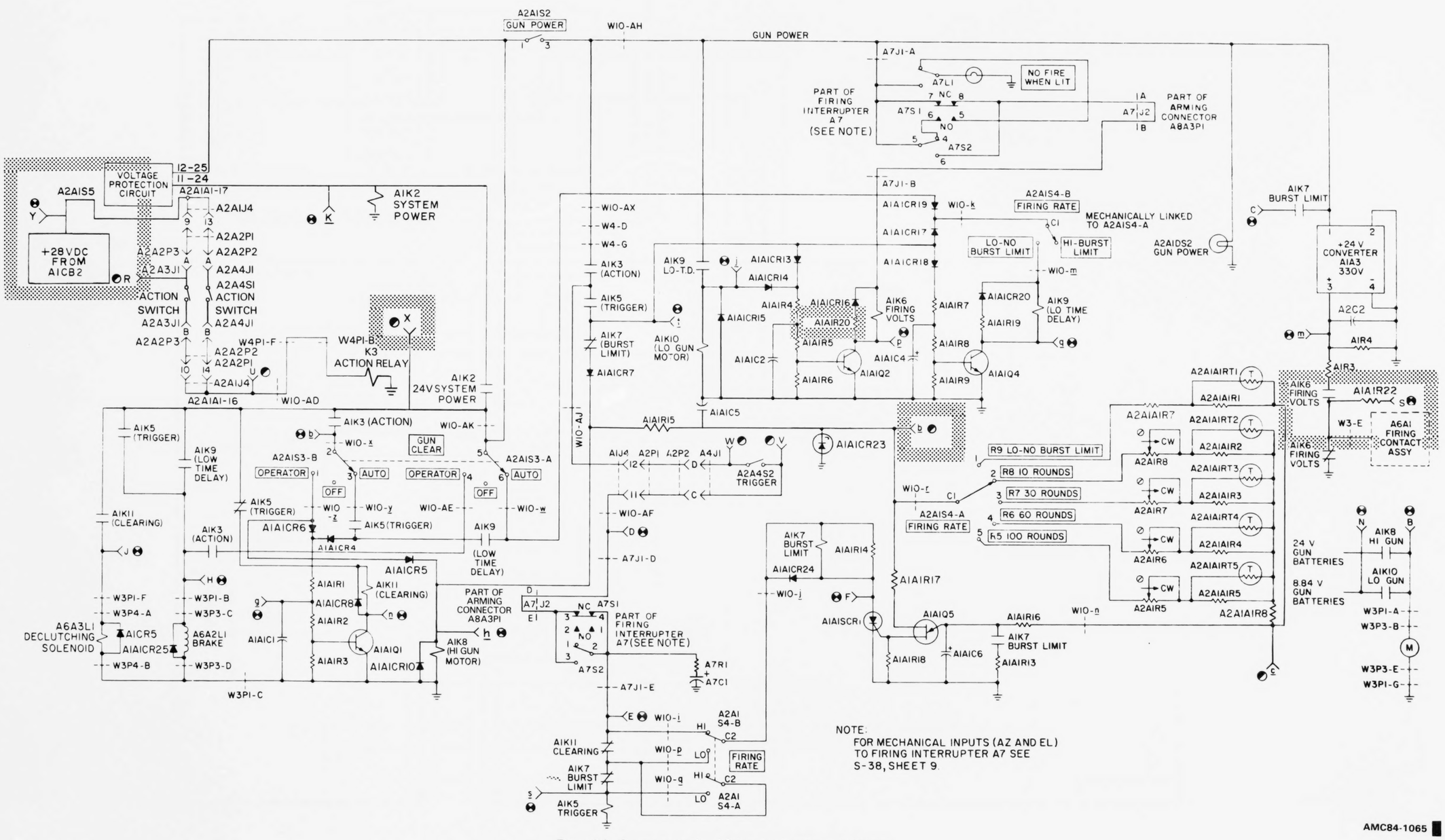
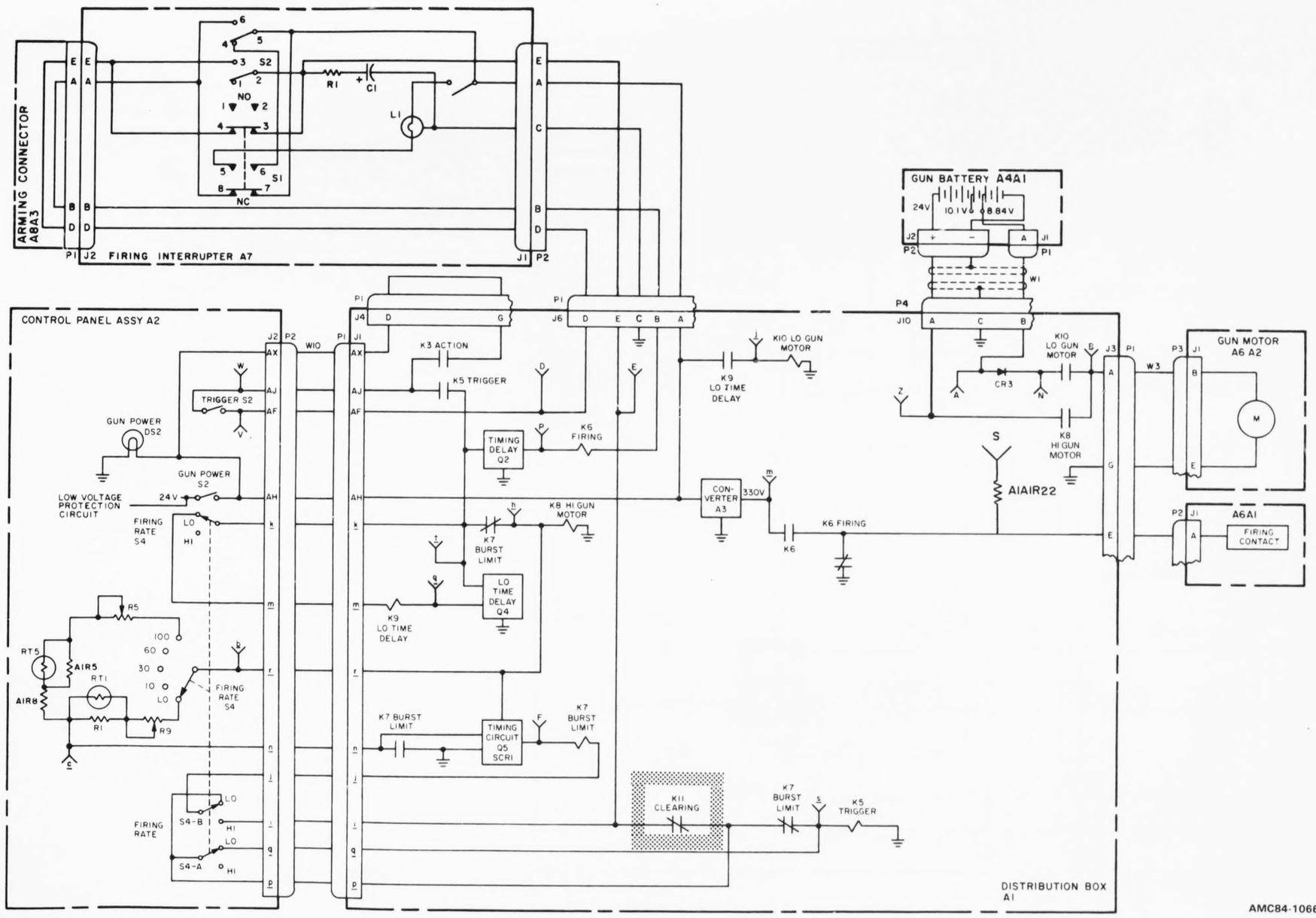


Figure S-1. M167A1 system overall simplified block diagram.



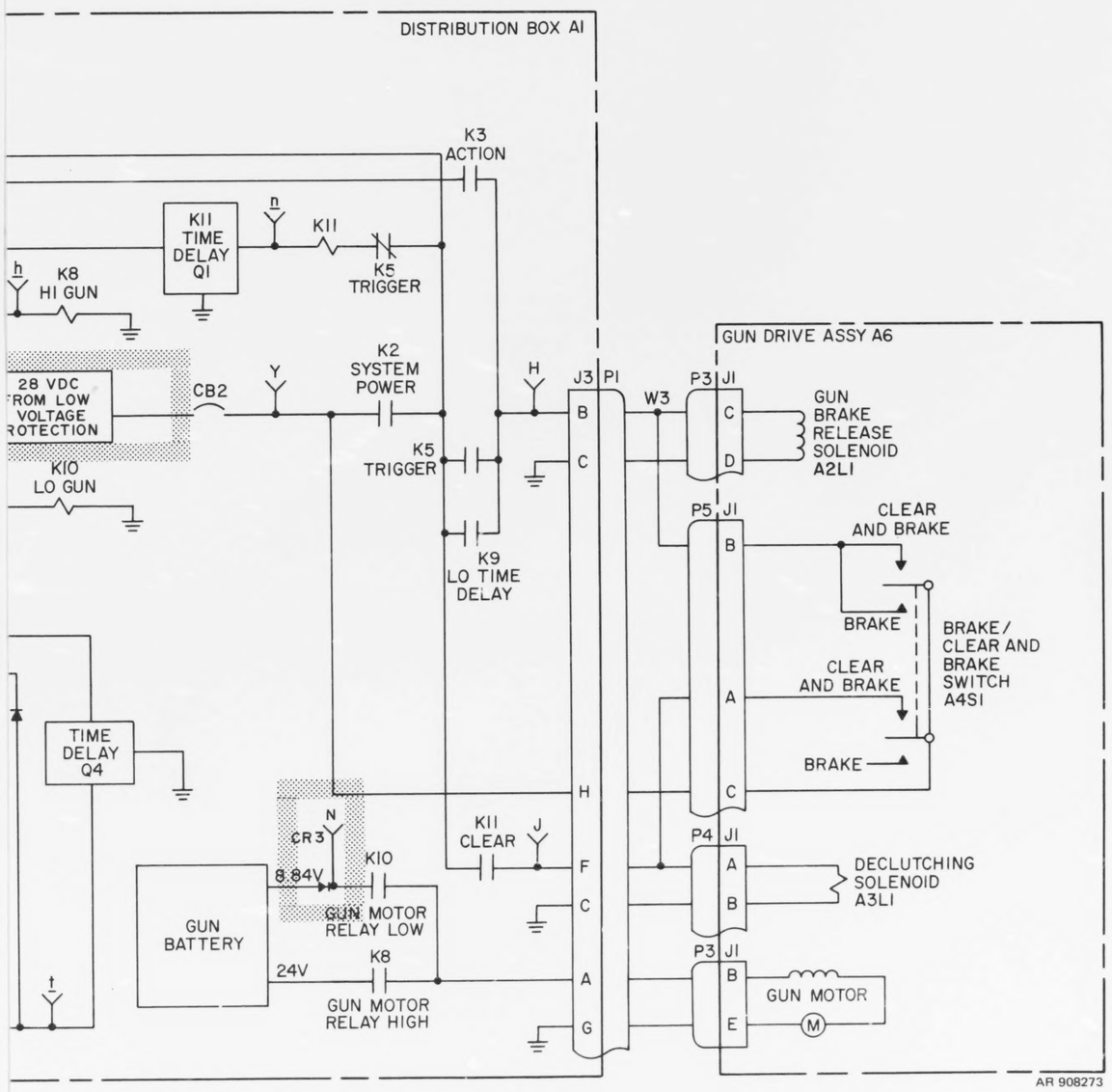
AMC84-1065

Figure S-2. Cannon control and firing circuits schematic diagram.



AMC84-1066

Figure S-3. Cannon control and firing circuits functional diagram.



n clearing circuits functional diagram.

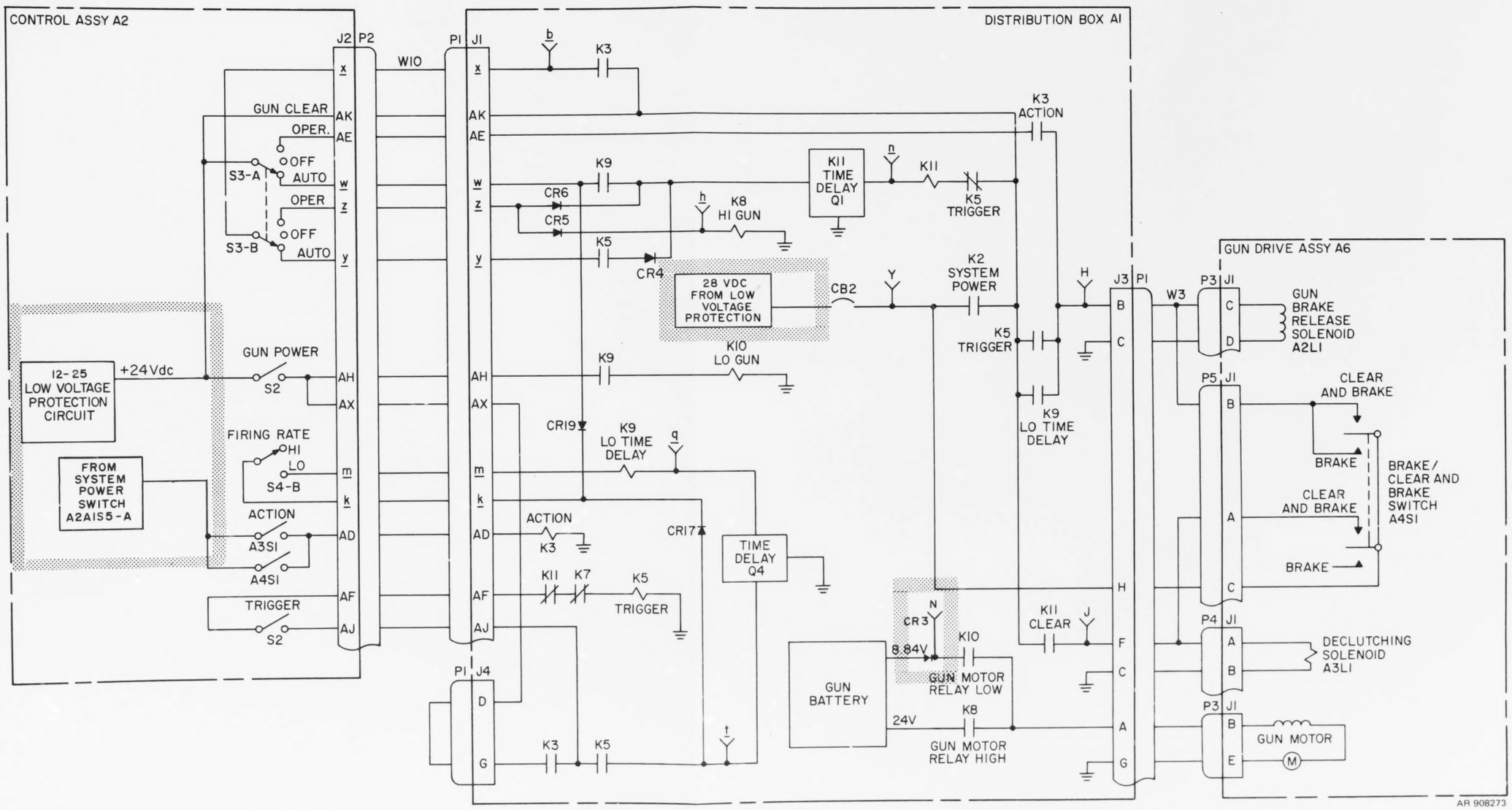


Figure S-4. Gun clearing circuits functional diagram.

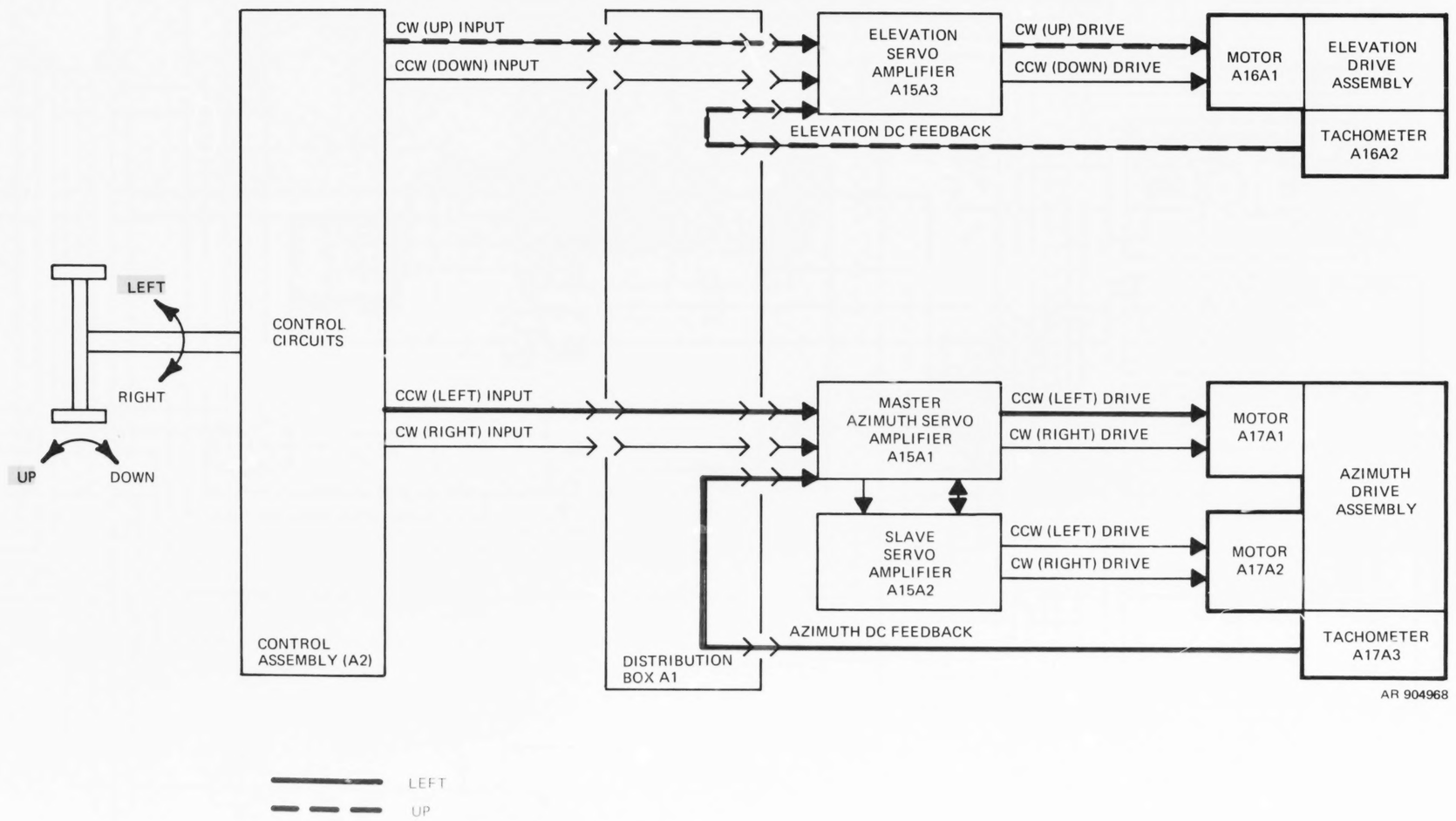


Figure S-5. Mount system block diagram.

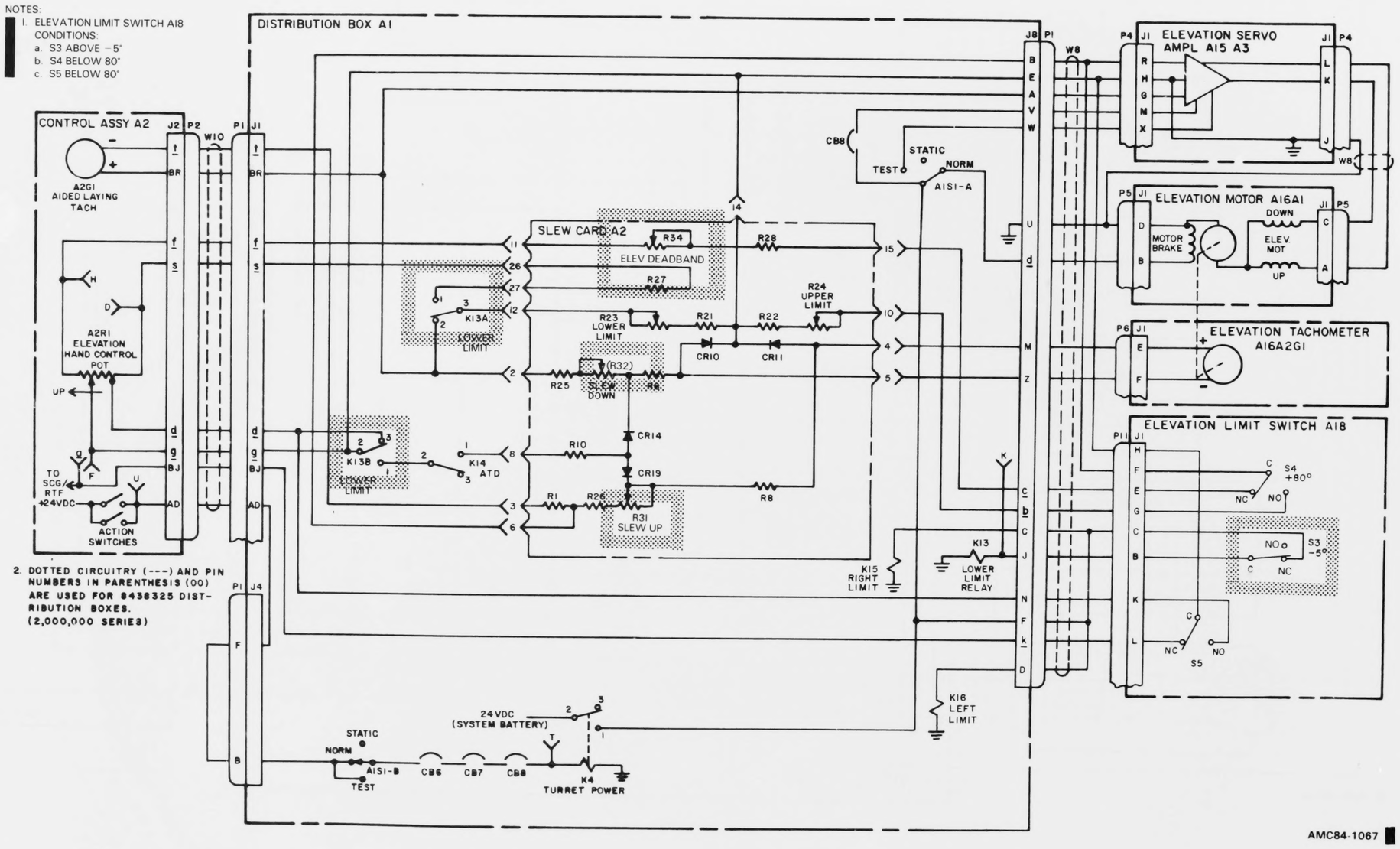


Figure S-6. Mount elevation control functional diagram.

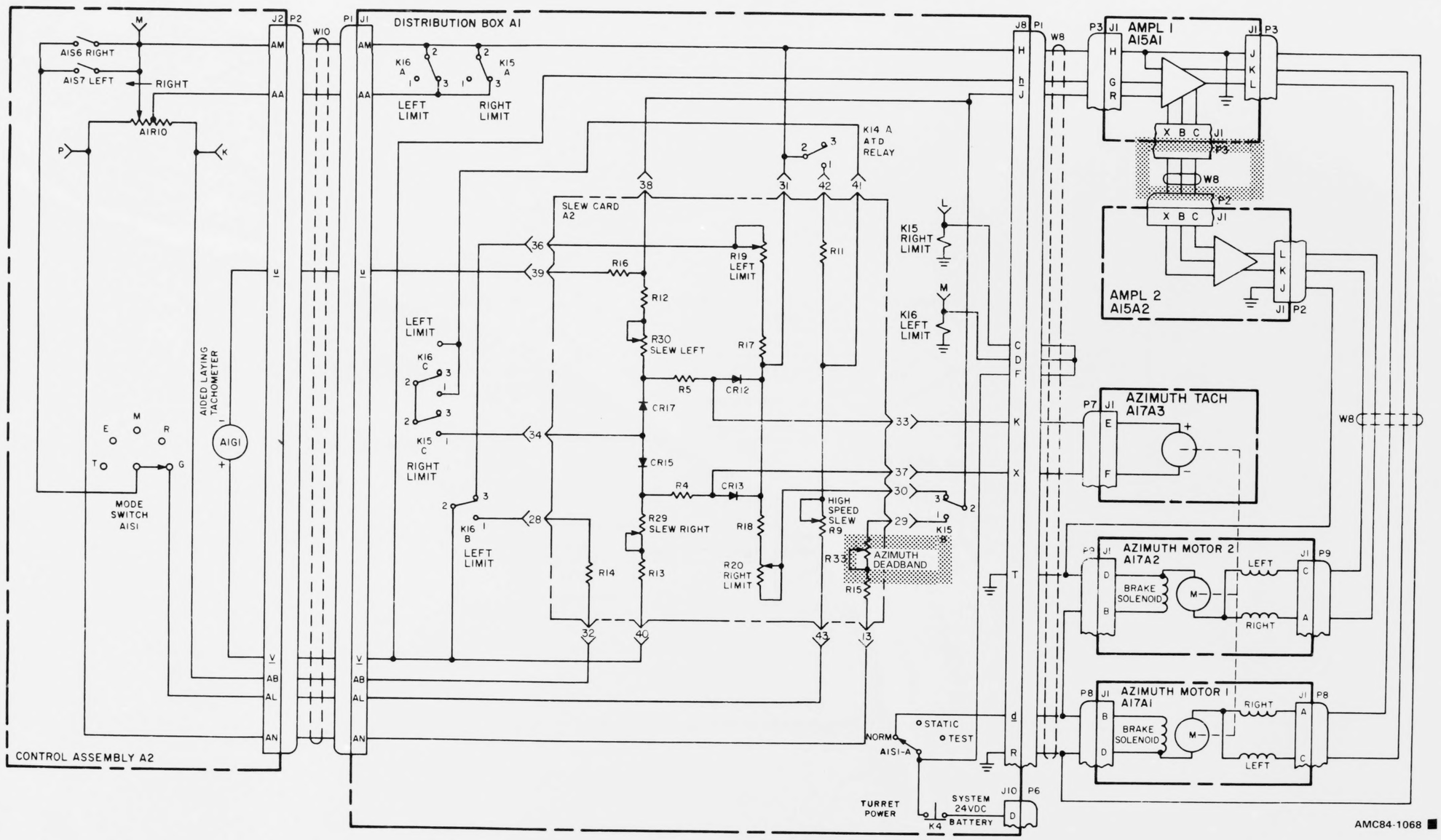
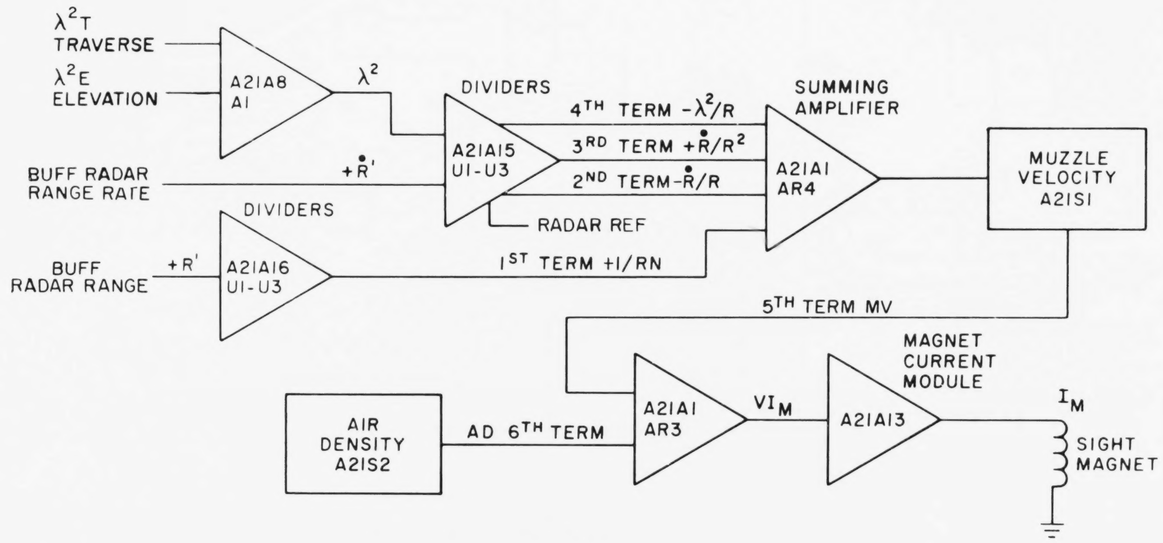
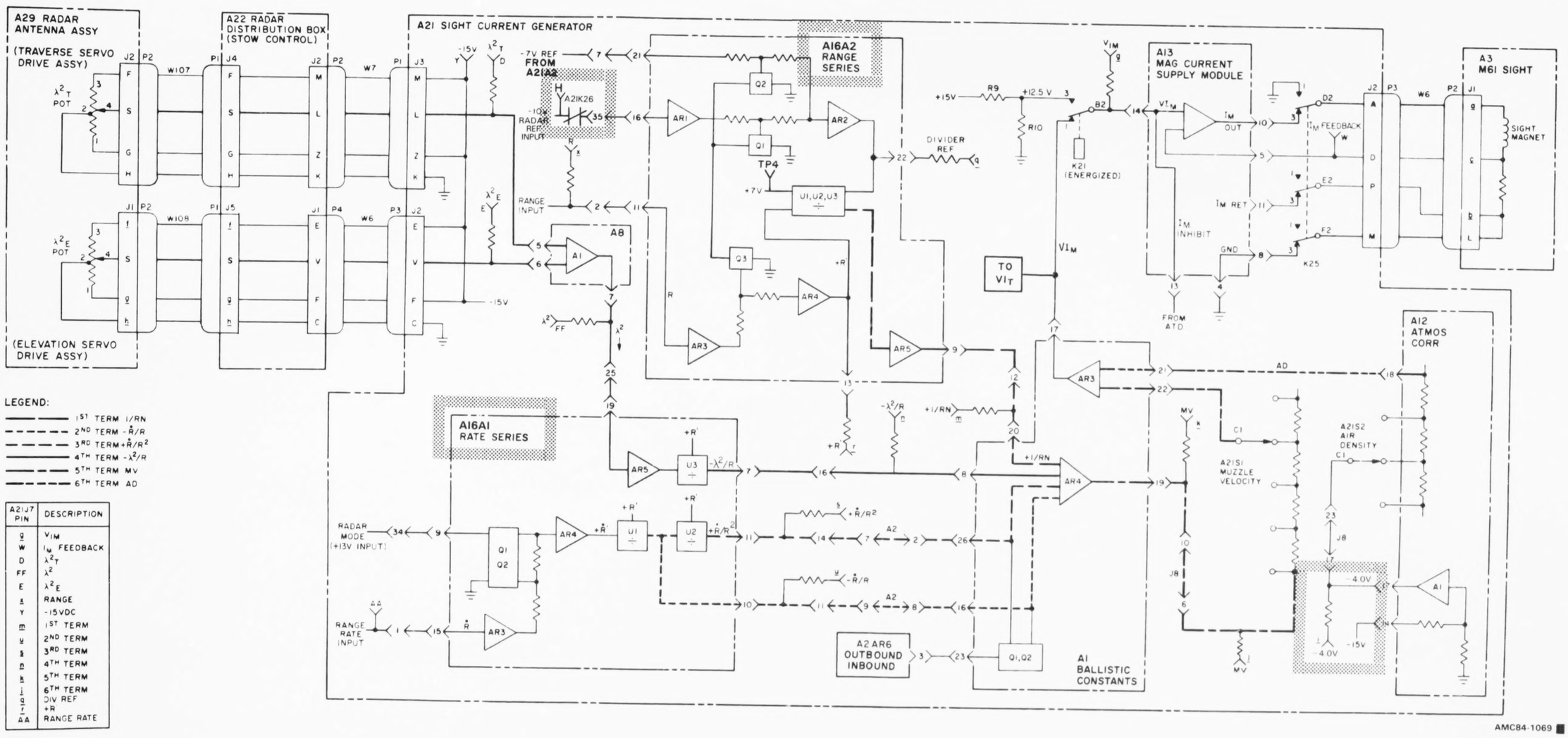


Figure S-7. Mount azimuth control functional diagram.



AR 904975

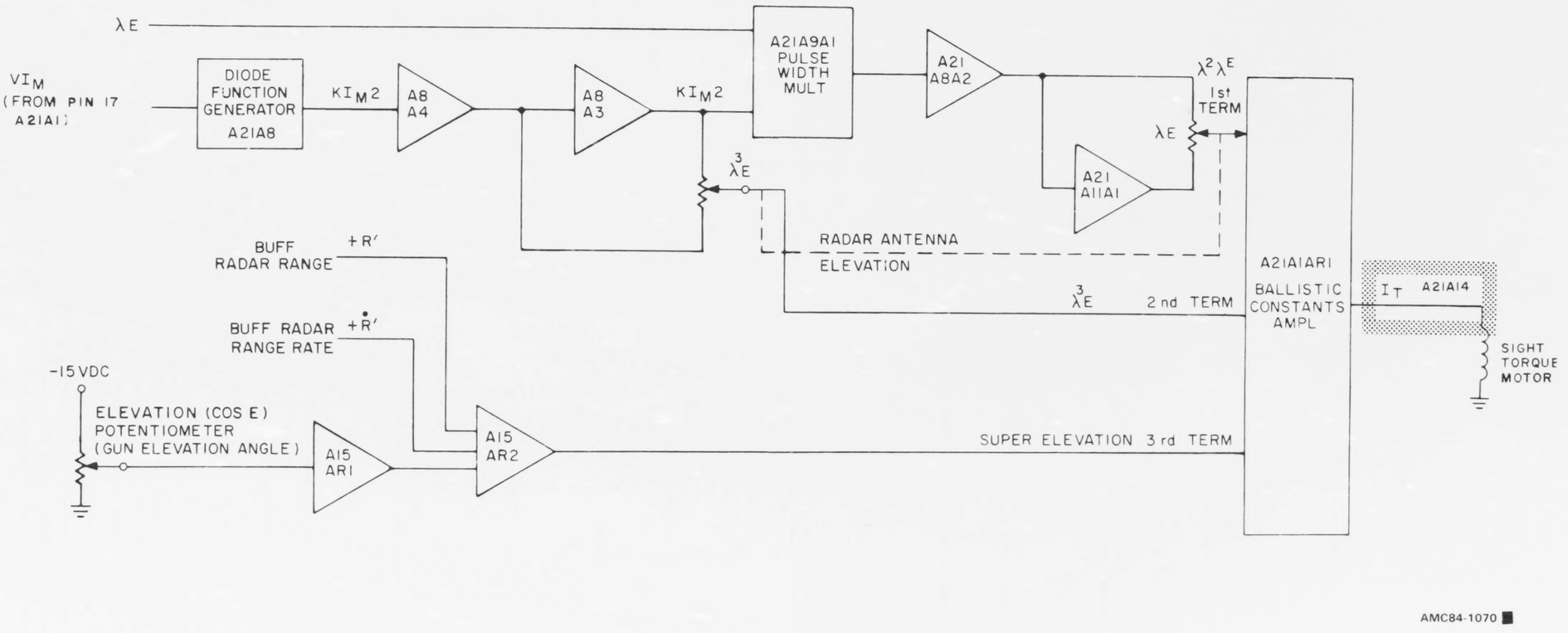
Figure S-8. Sight magnet current circuits simplified block diagram.



A21J7 PIN	DESCRIPTION
g	V_{IM}
w	I_M FEEDBACK
D	λ^2_T
FF	λ^2
E	λ^2_E
s	RANGE
Y	-15VDC
m	1ST TERM
u	2ND TERM
s	3RD TERM
n	4TH TERM
k	5TH TERM
j	6TH TERM
q	DIV REF
r	+R
AA	RANGE RATE

AMC84-1069

Figure S-9. Sight magnet current circuits functional diagram.



AMC84-1070

Figure S-10. Sight torque current circuits simplified block diagram.

SIGHT TORQUE CURRENT TEST POINTS	
A21J7 PIN	DESCRIPTION OF SIGNAL
A	COS E
C	2ND TERM $\lambda^3 E$
h	VI_T
P	SUPER EL
V	I_T FEEDBACK
Y	-15 VDC
BB	KI_M^2
EE	$KI_M^2\lambda^2$
FF	λ^2
GG	SERRASOID (AC)

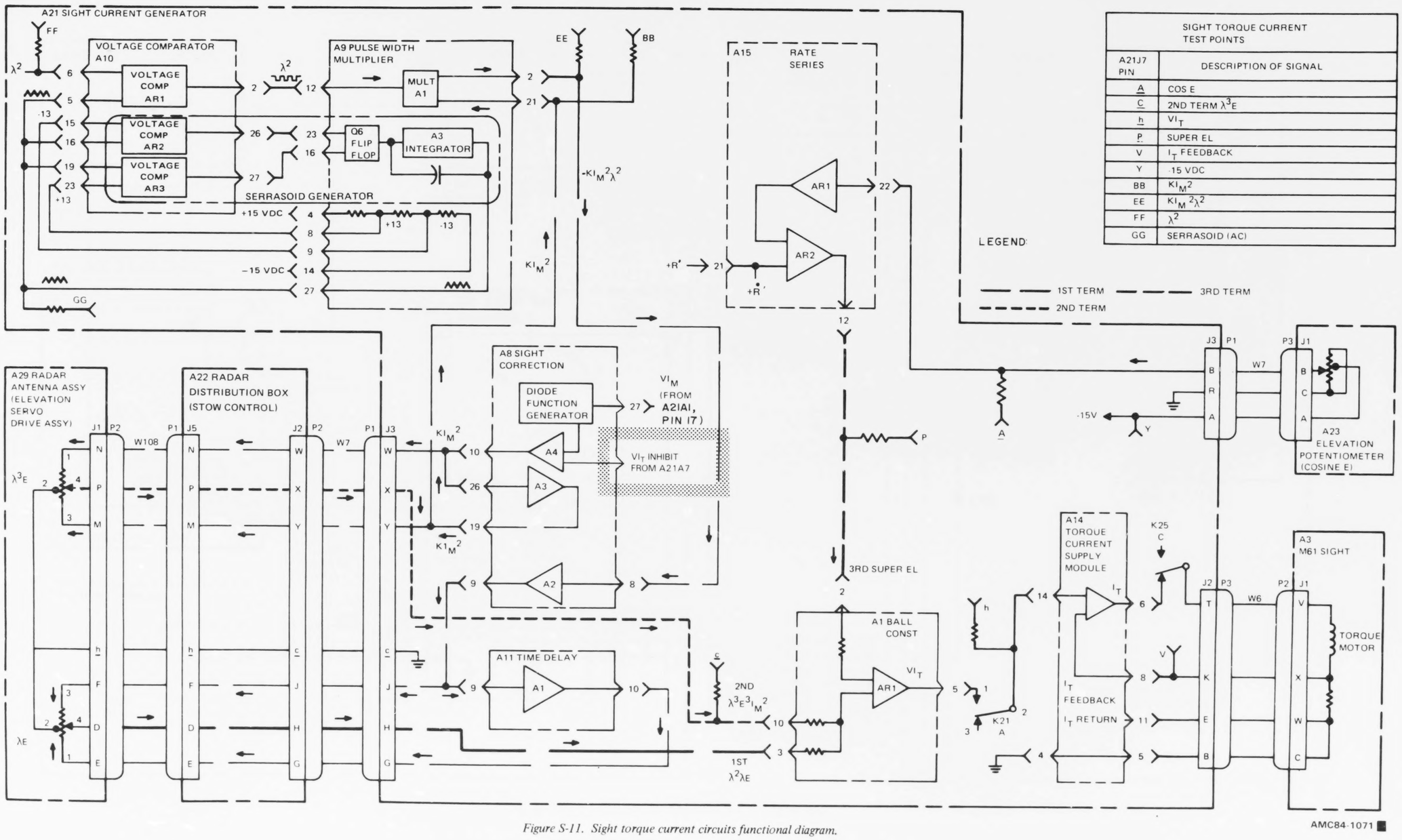


Figure S-11. Sight torque current circuits functional diagram.

AMC84-1071

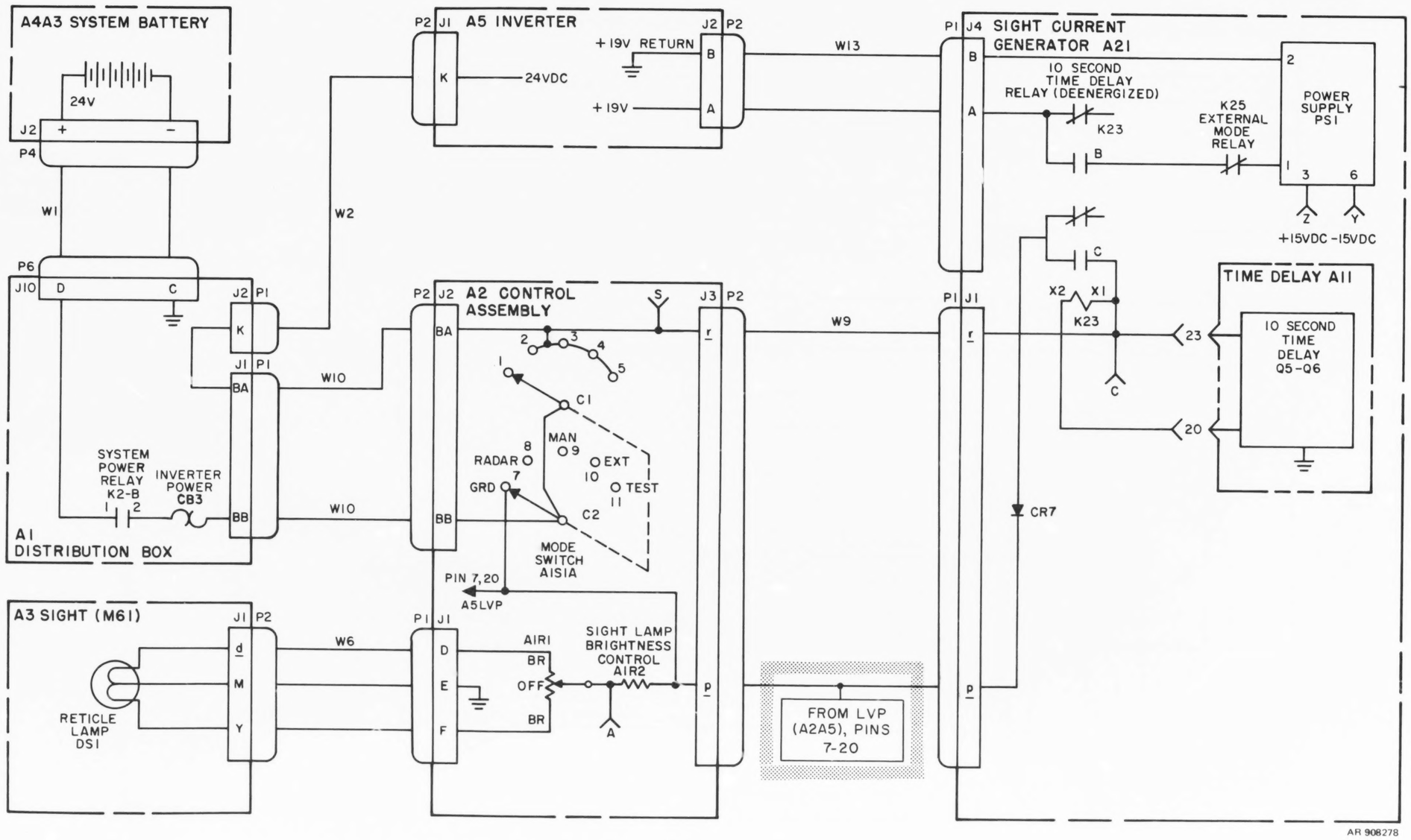


Figure S-12. Ten-second time delay circuit functional diagram.

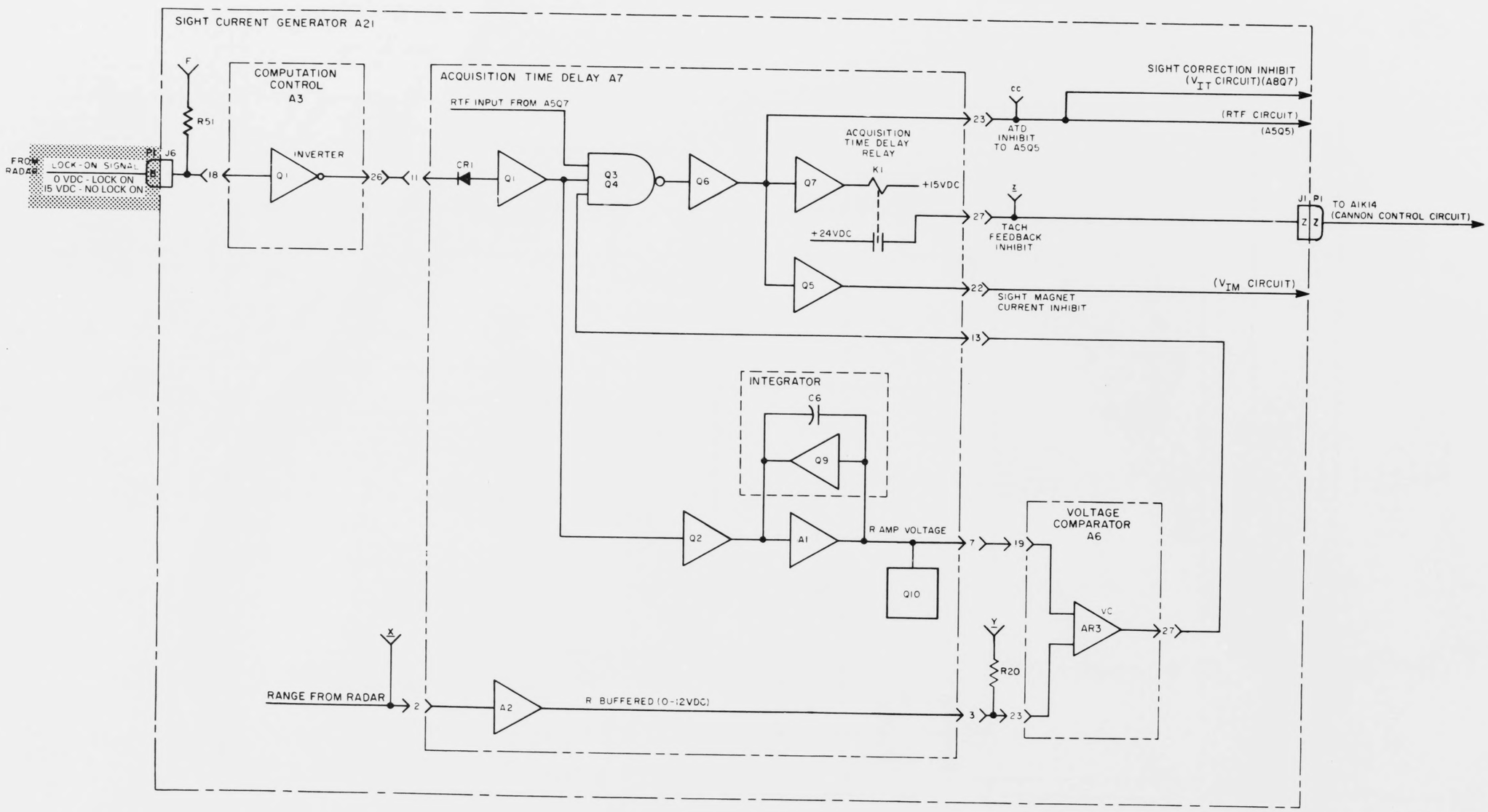
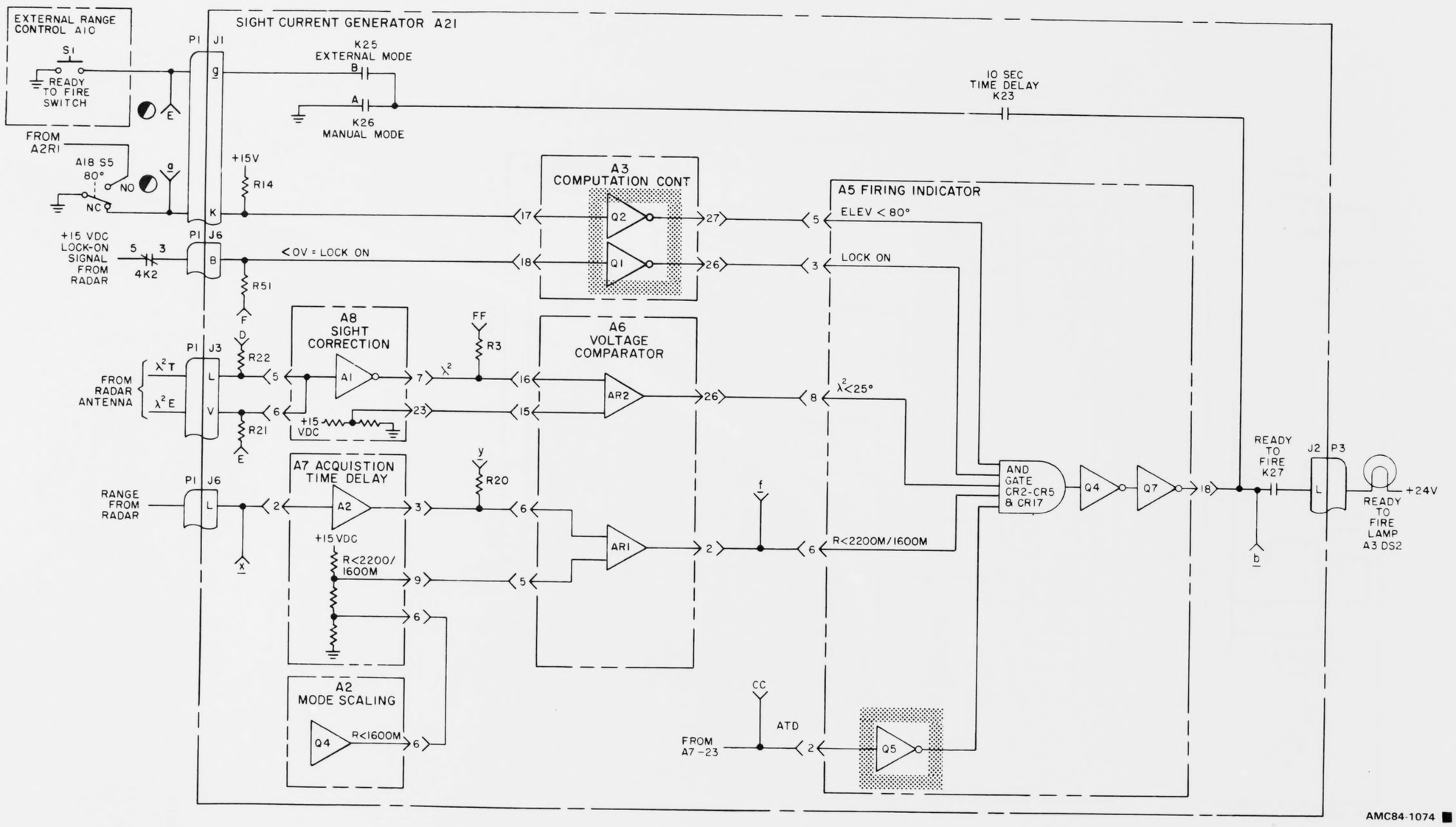


Figure S-13. Acquisition time delay circuit functional diagram.

AMC84-1073 ■



AMC84-1074

Figure S-14. Ready-to-fire circuit functional diagram.

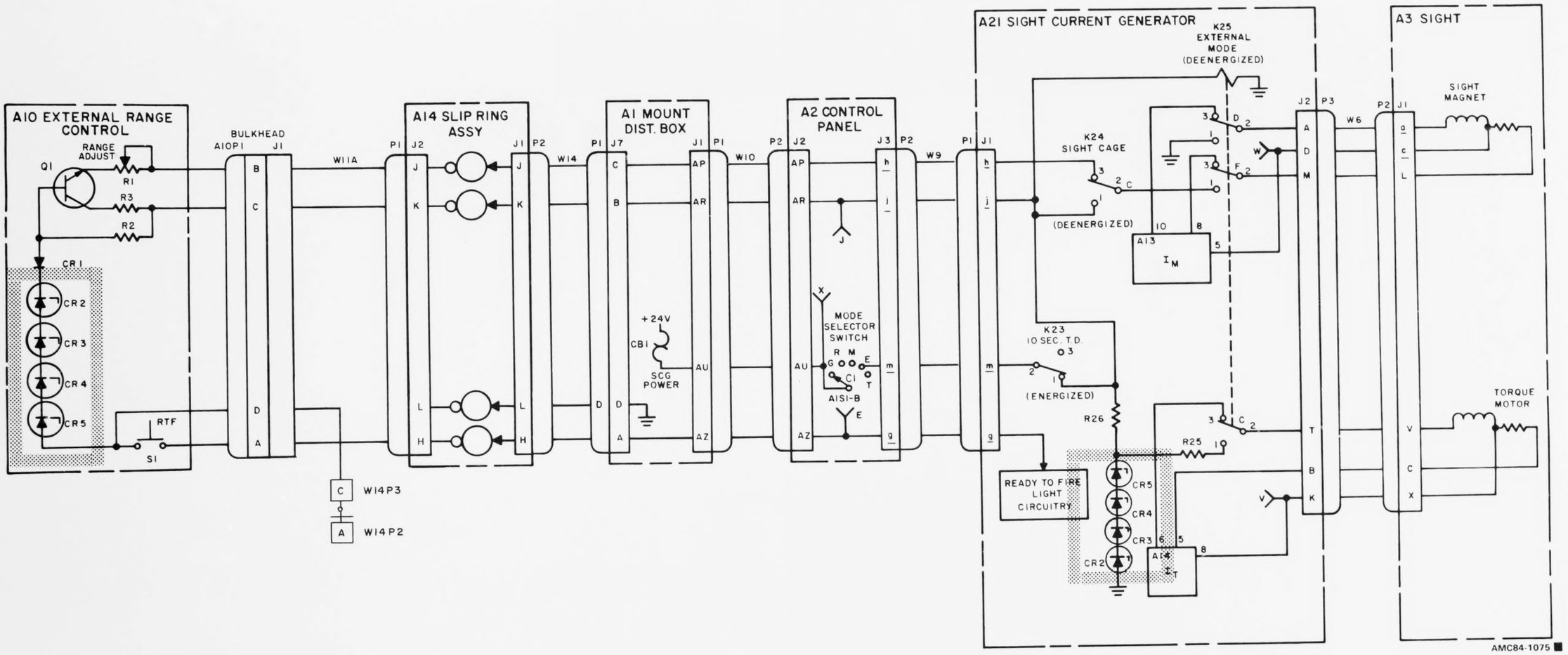
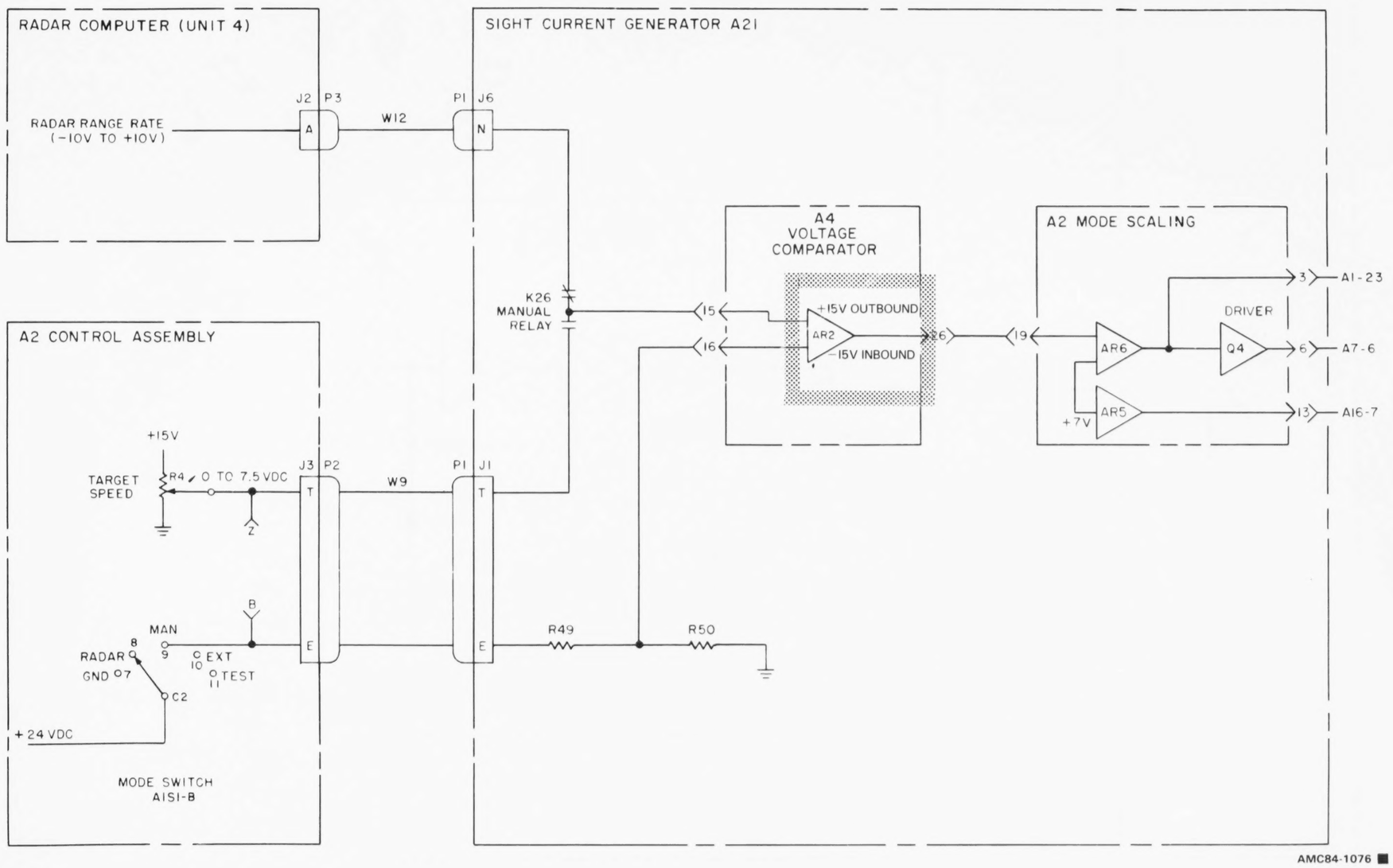


Figure S-15. External range control circuit functional diagram.



AMC84-1076 ■

Figure 8-16. Mode scaling functional diagram.

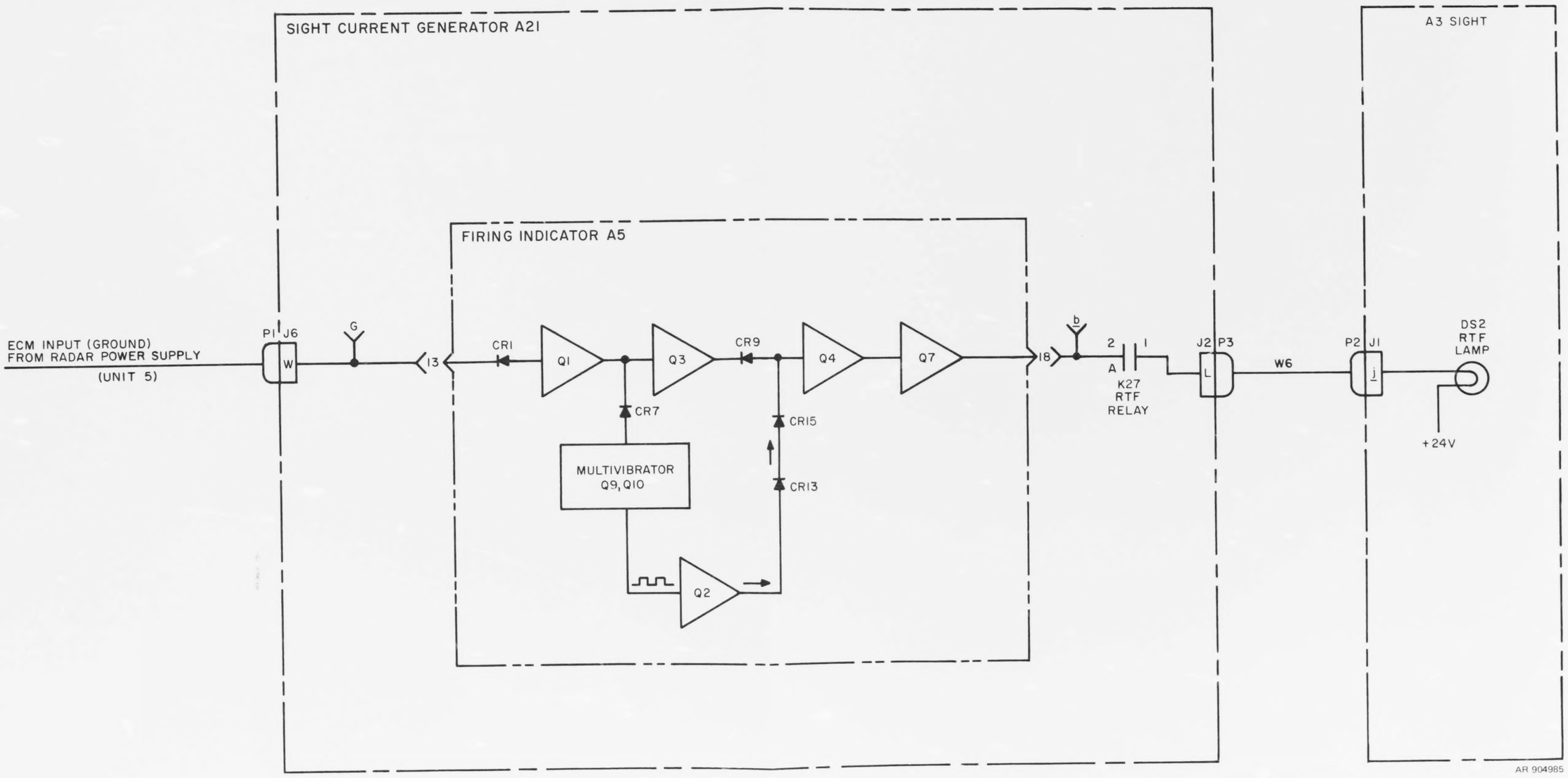


Figure S-17. Electronic countermeasure detection circuit functional diagram.

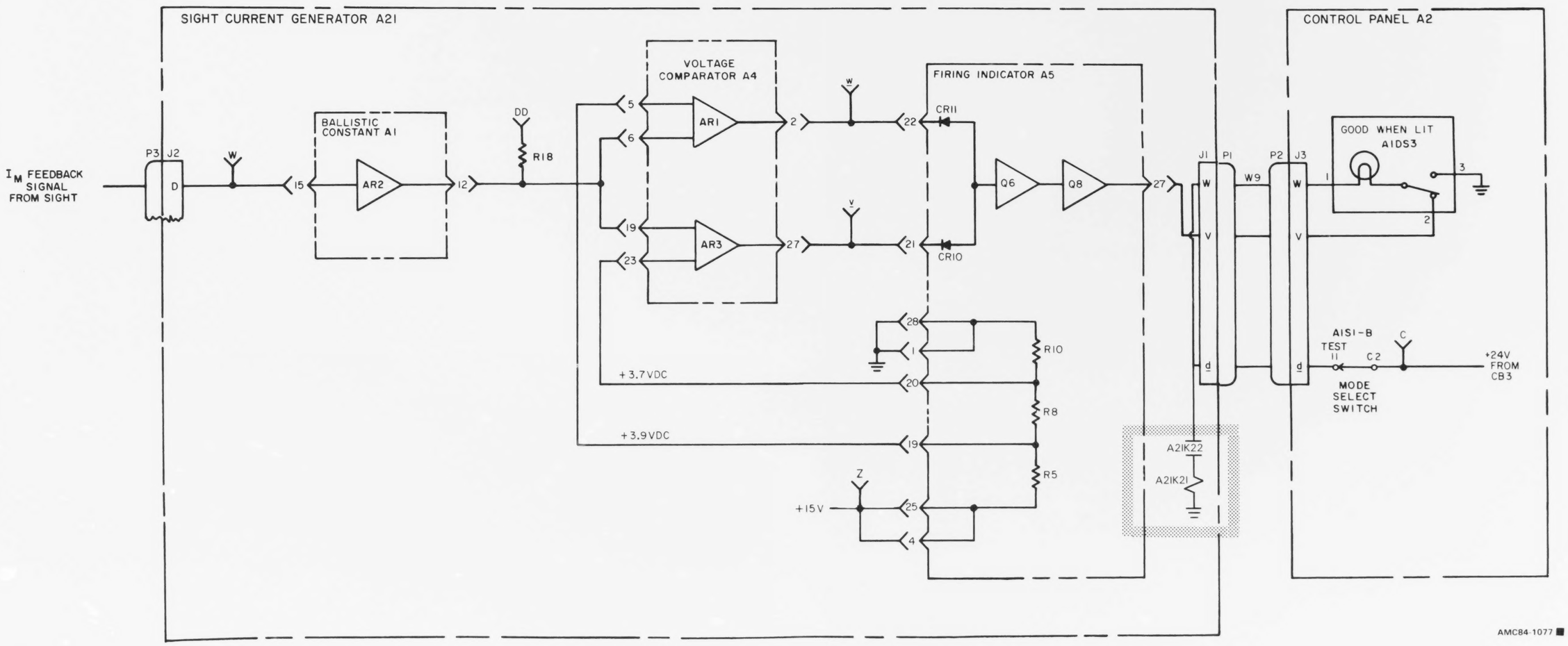


Figure S-18. Self test circuit functional diagram.

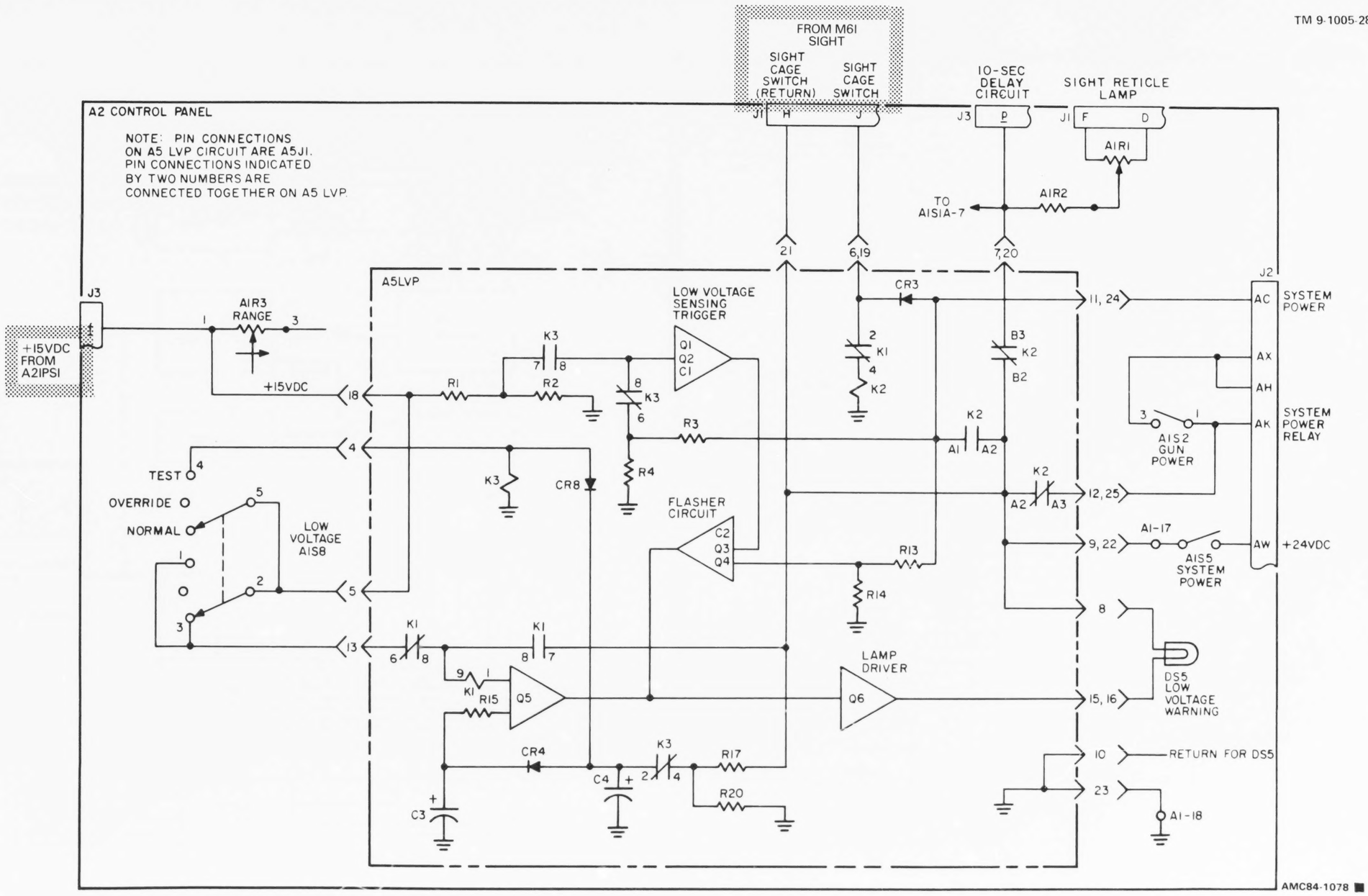


Figure S-19. Low voltage protection circuit functional diagram.

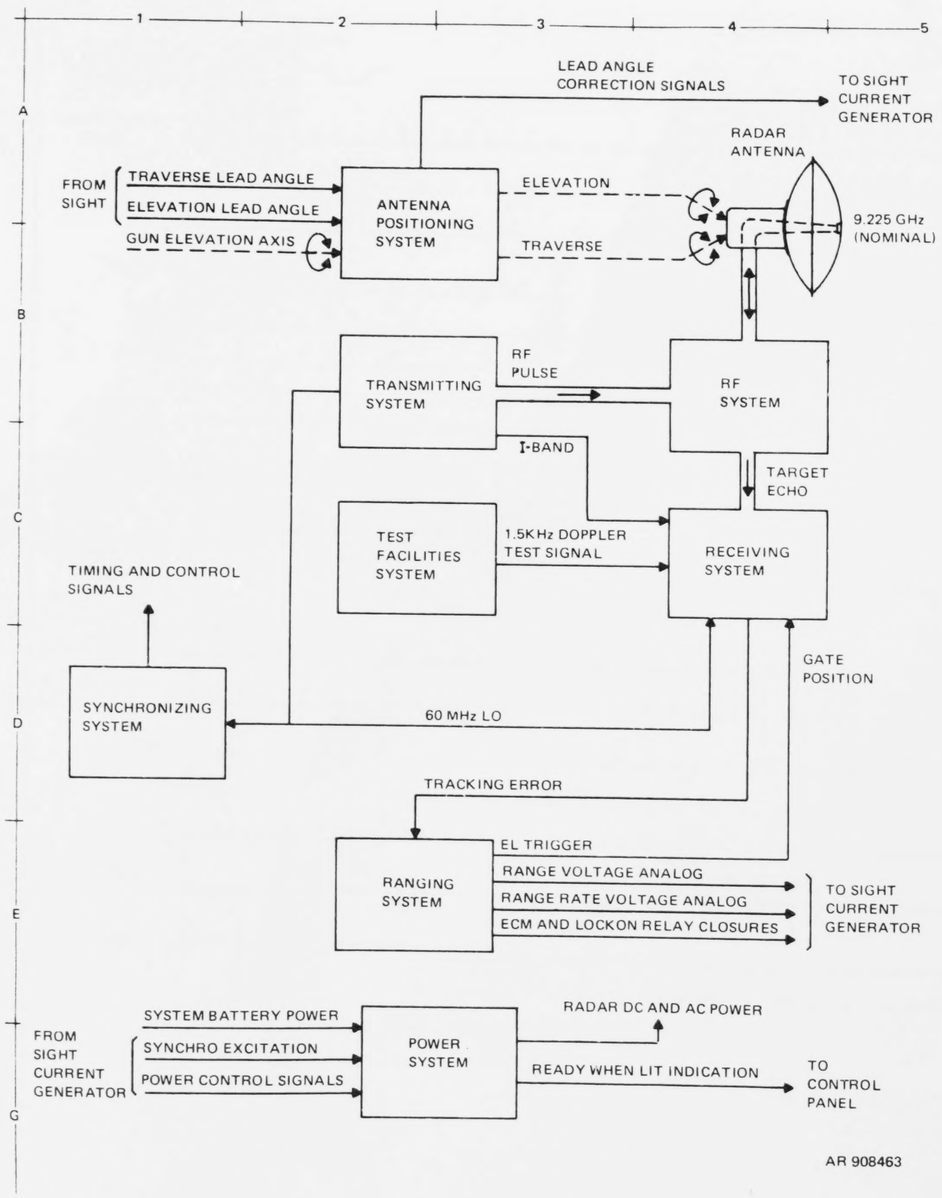


Figure S-20. Radar set AN/VPS-2 functional block diagram.

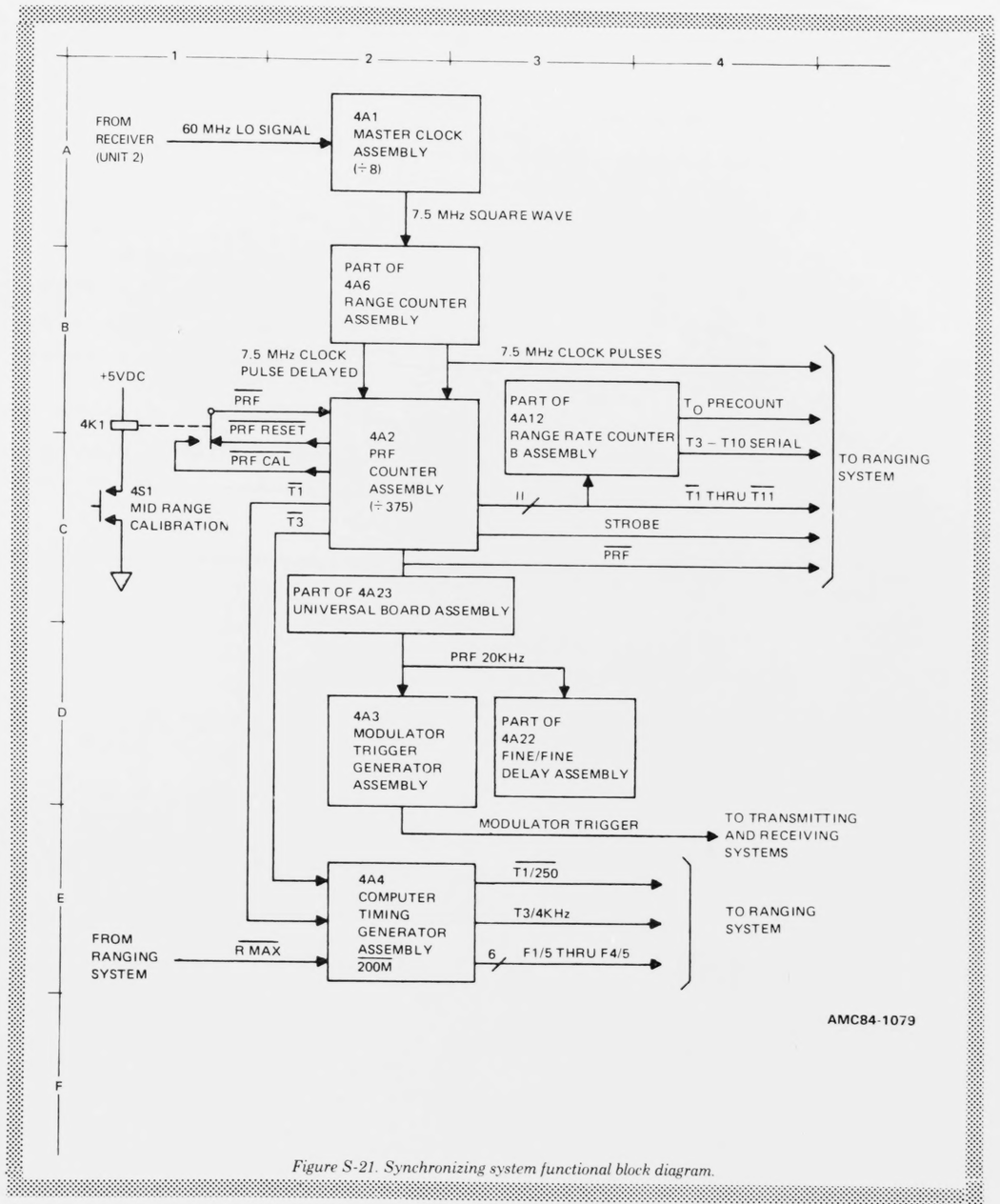
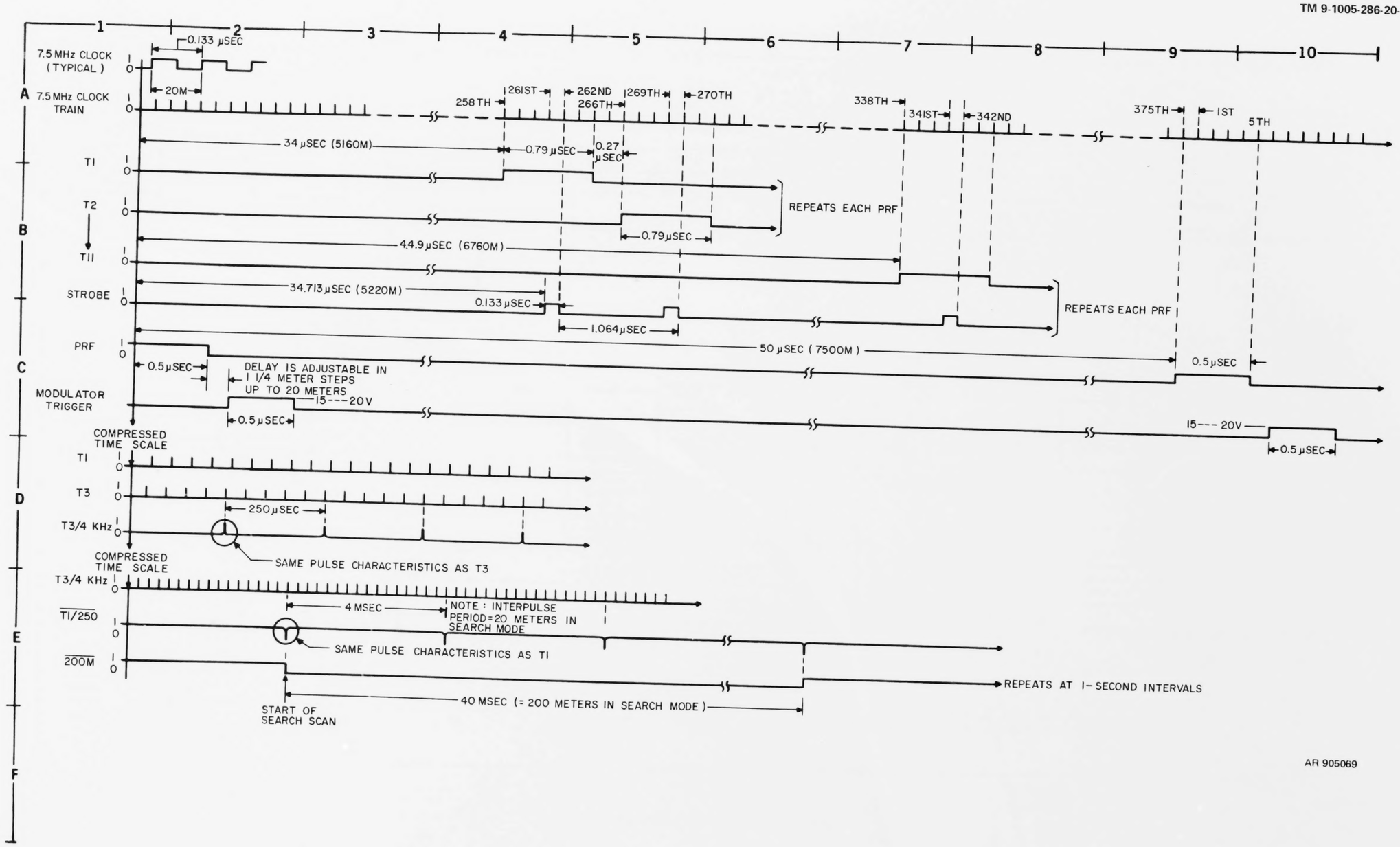
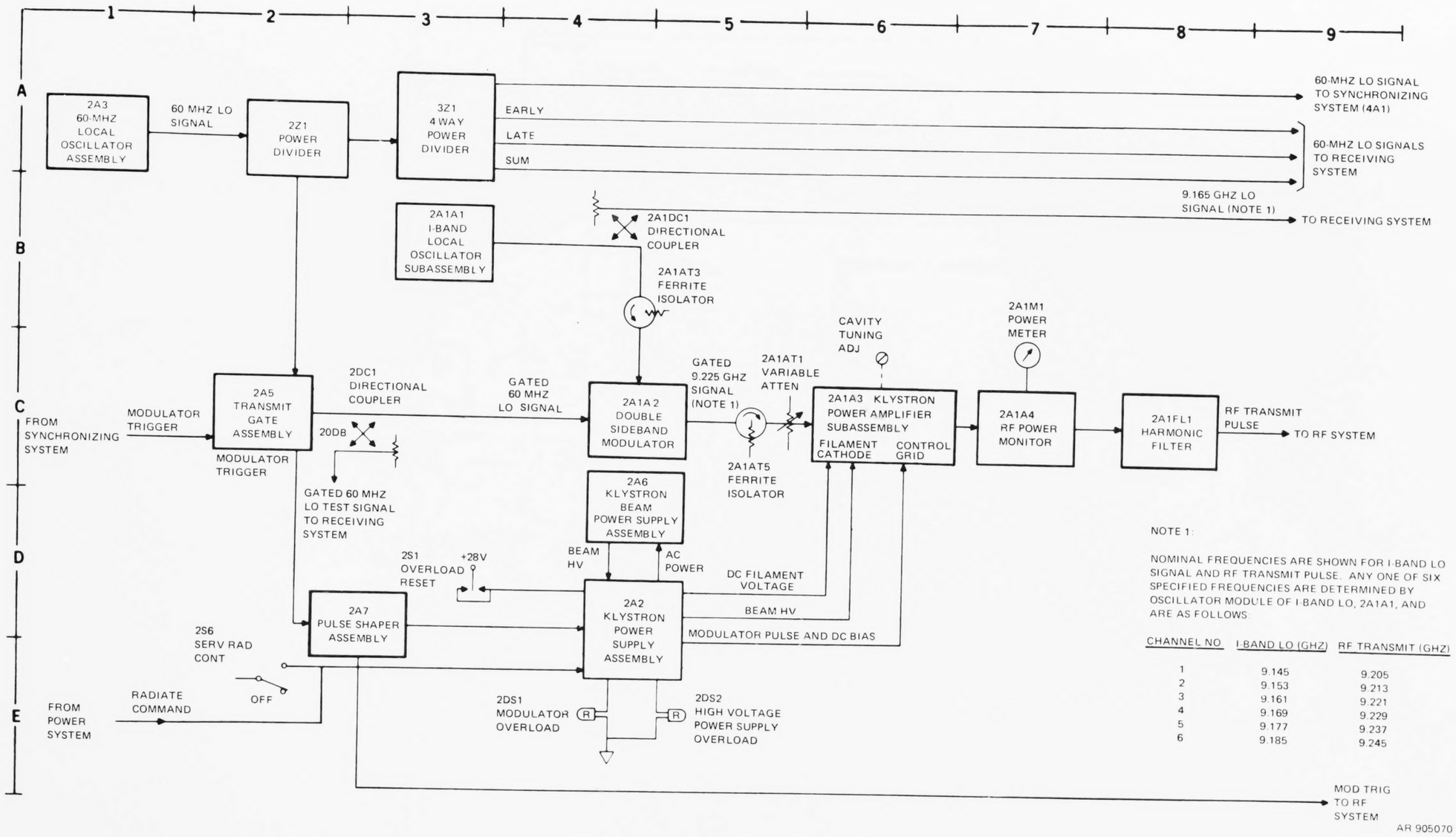


Figure S-21. Synchronizing system functional block diagram.



AR 905069

Figure S-22. Synchronizing system timing diagram.



NOTE 1:

NOMINAL FREQUENCIES ARE SHOWN FOR I-BAND LO SIGNAL AND RF TRANSMIT PULSE. ANY ONE OF SIX SPECIFIED FREQUENCIES ARE DETERMINED BY OSCILLATOR MODULE OF I-BAND LO, 2A1A1, AND ARE AS FOLLOWS:

CHANNEL NO	I-BAND LO (GHZ)	RF TRANSMIT (GHZ)
1	9.145	9.205
2	9.153	9.213
3	9.161	9.221
4	9.169	9.229
5	9.177	9.237
6	9.185	9.245

Figure S-23. Transmitting system functional block diagram.

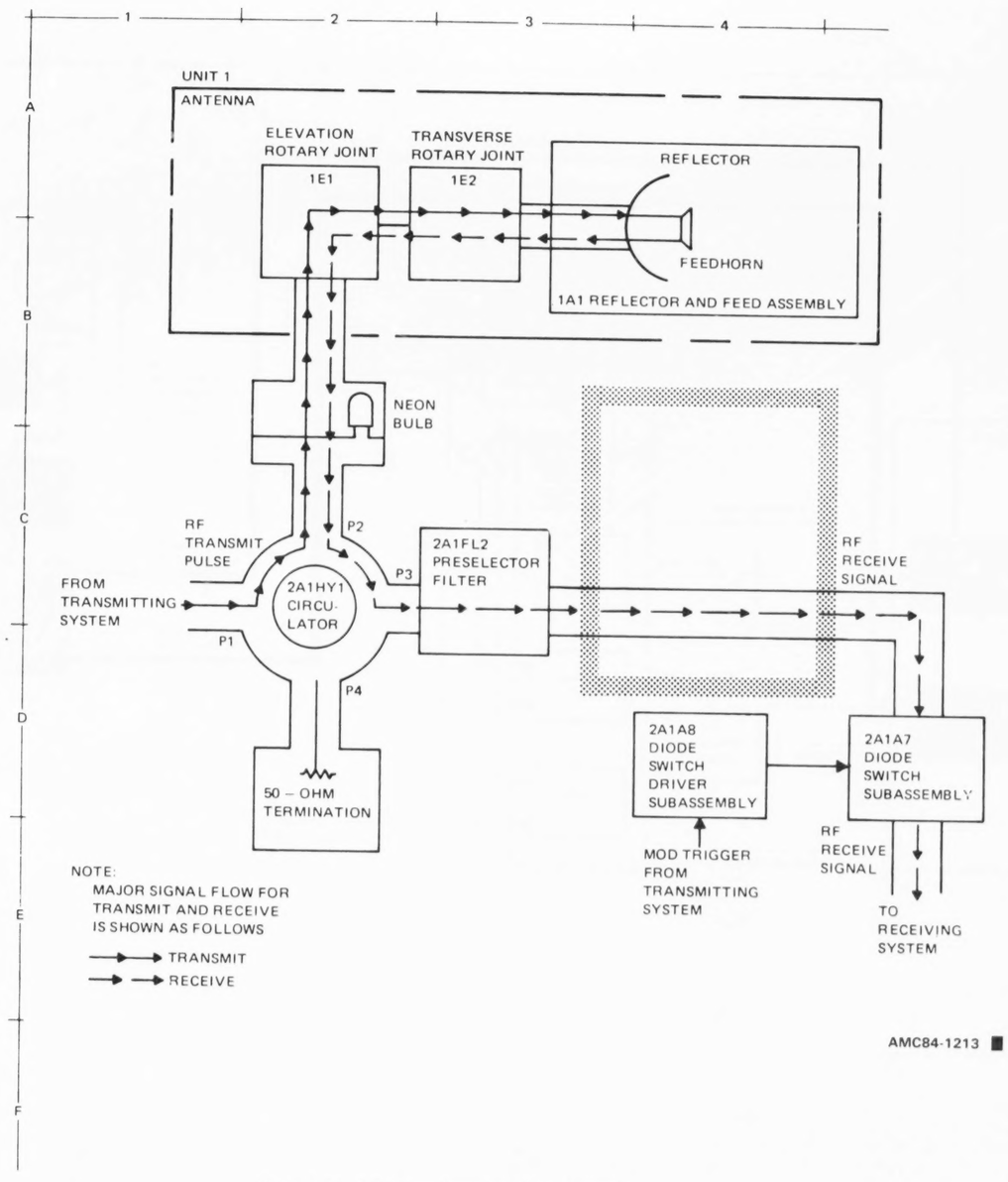


Figure S-24. RF system functional block diagram.

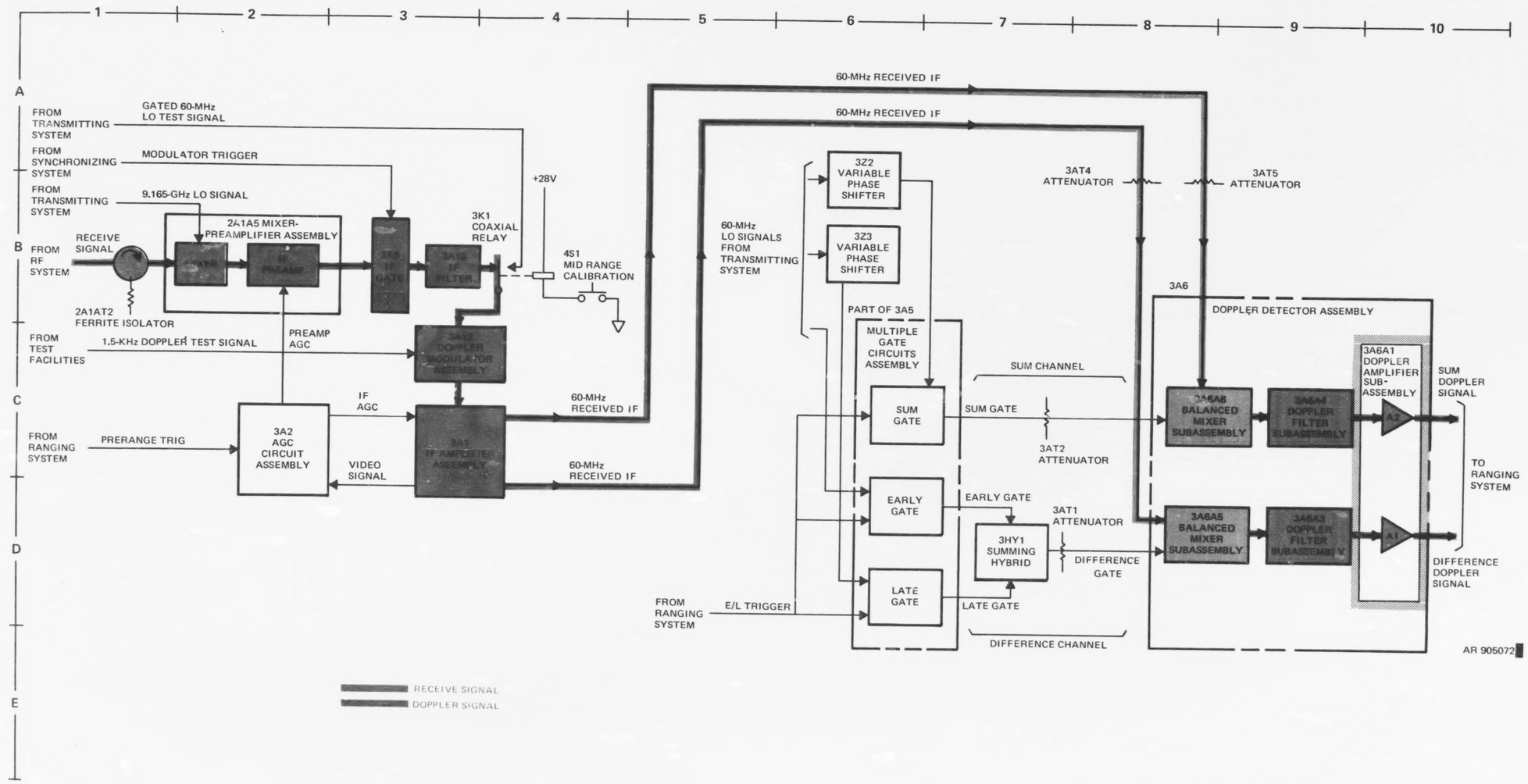


Figure S-25. Receiving system functional block diagram.

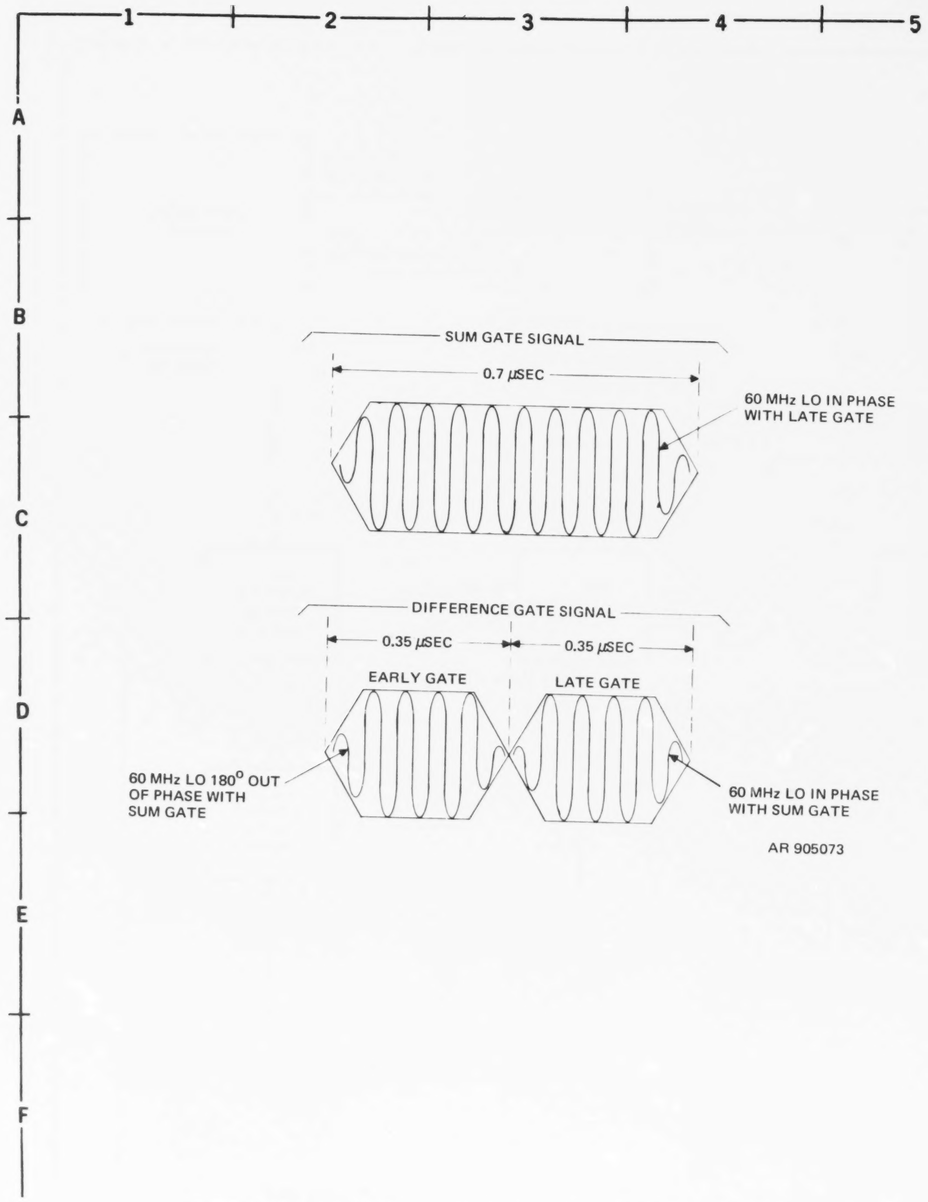


Figure S-26. Sum and difference gate signals waveform diagram.

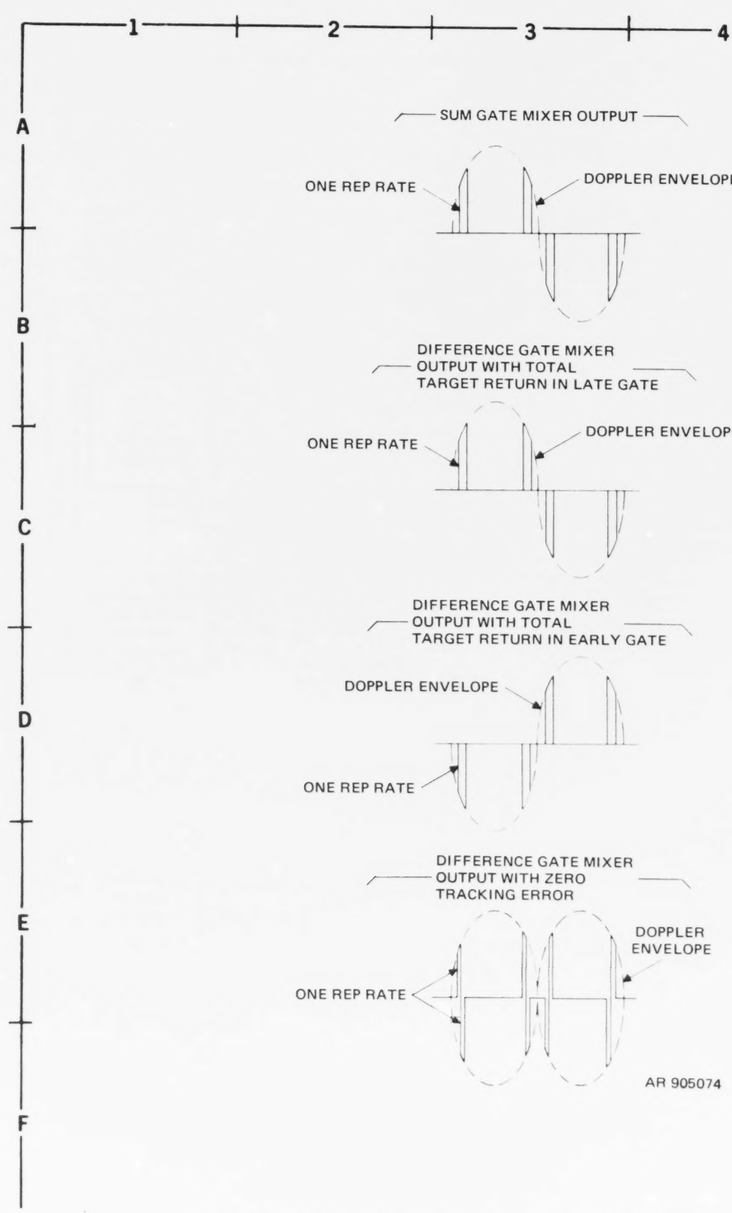
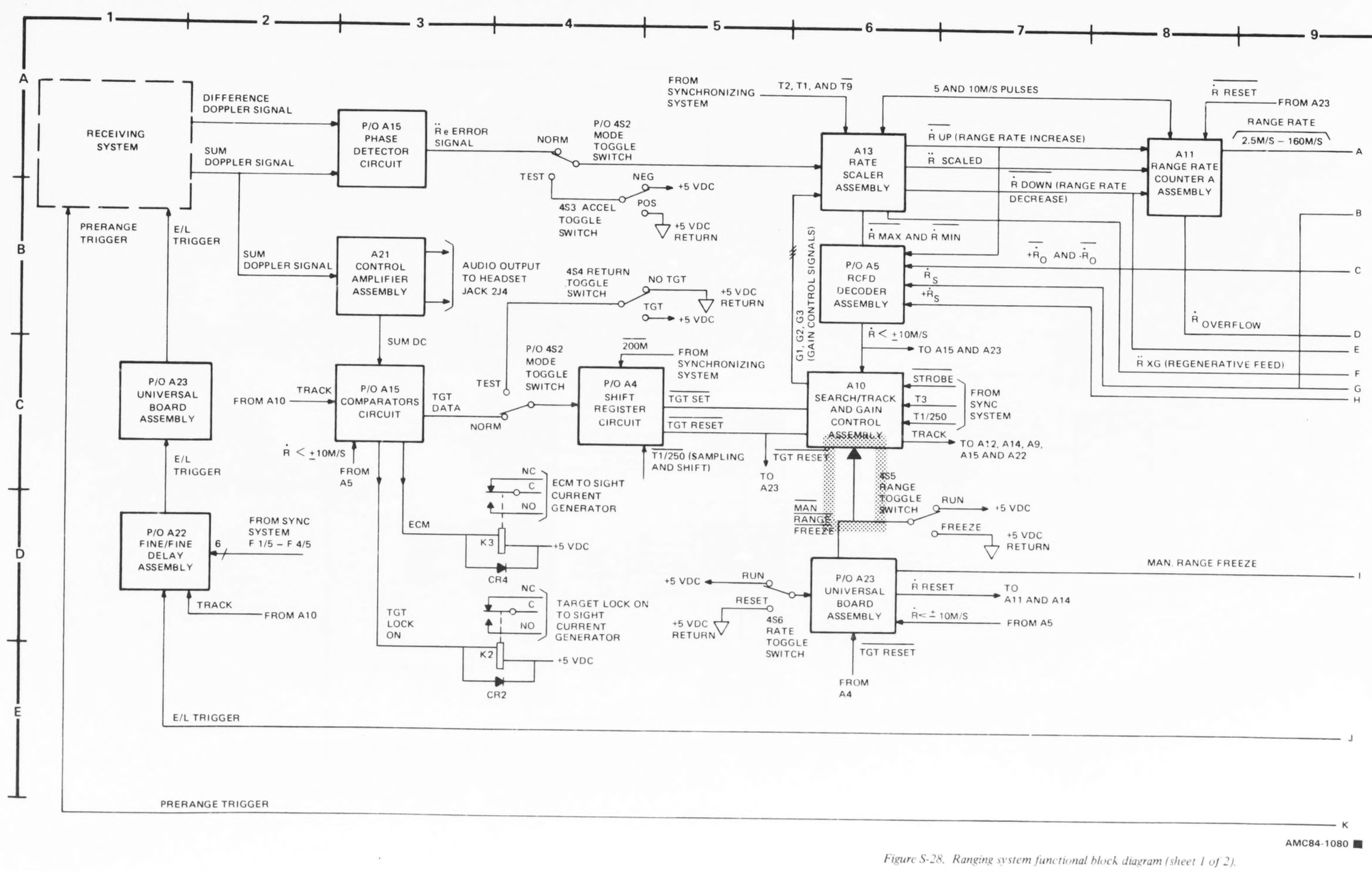


Figure S-27. Output of sum and difference gates waveform diagram.



AMC84-1080

Figure S-28. Ranging system functional block diagram (sheet 1 of 2).

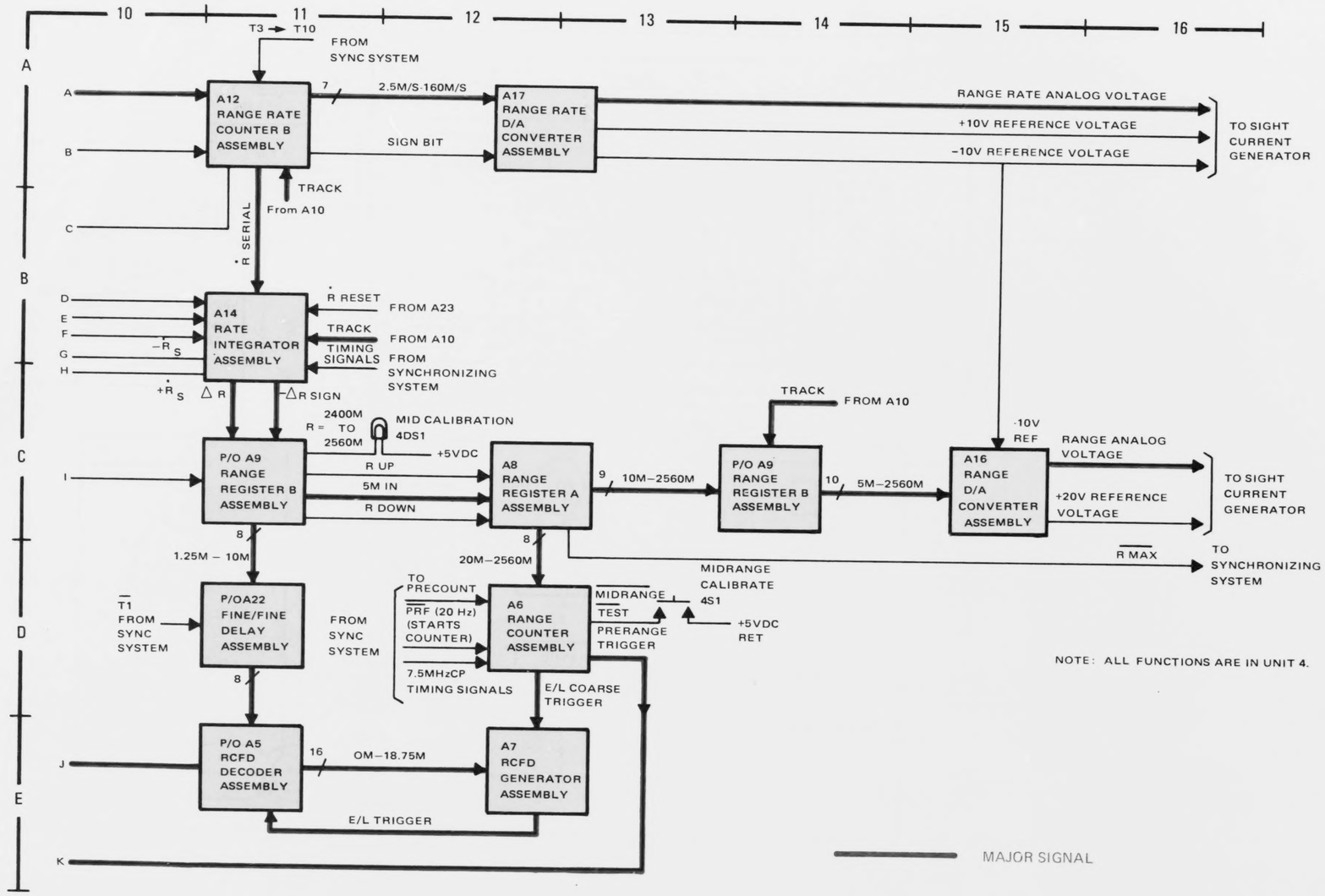


Figure S-28. Ranging system functional block diagram (sheet 2 of 2).

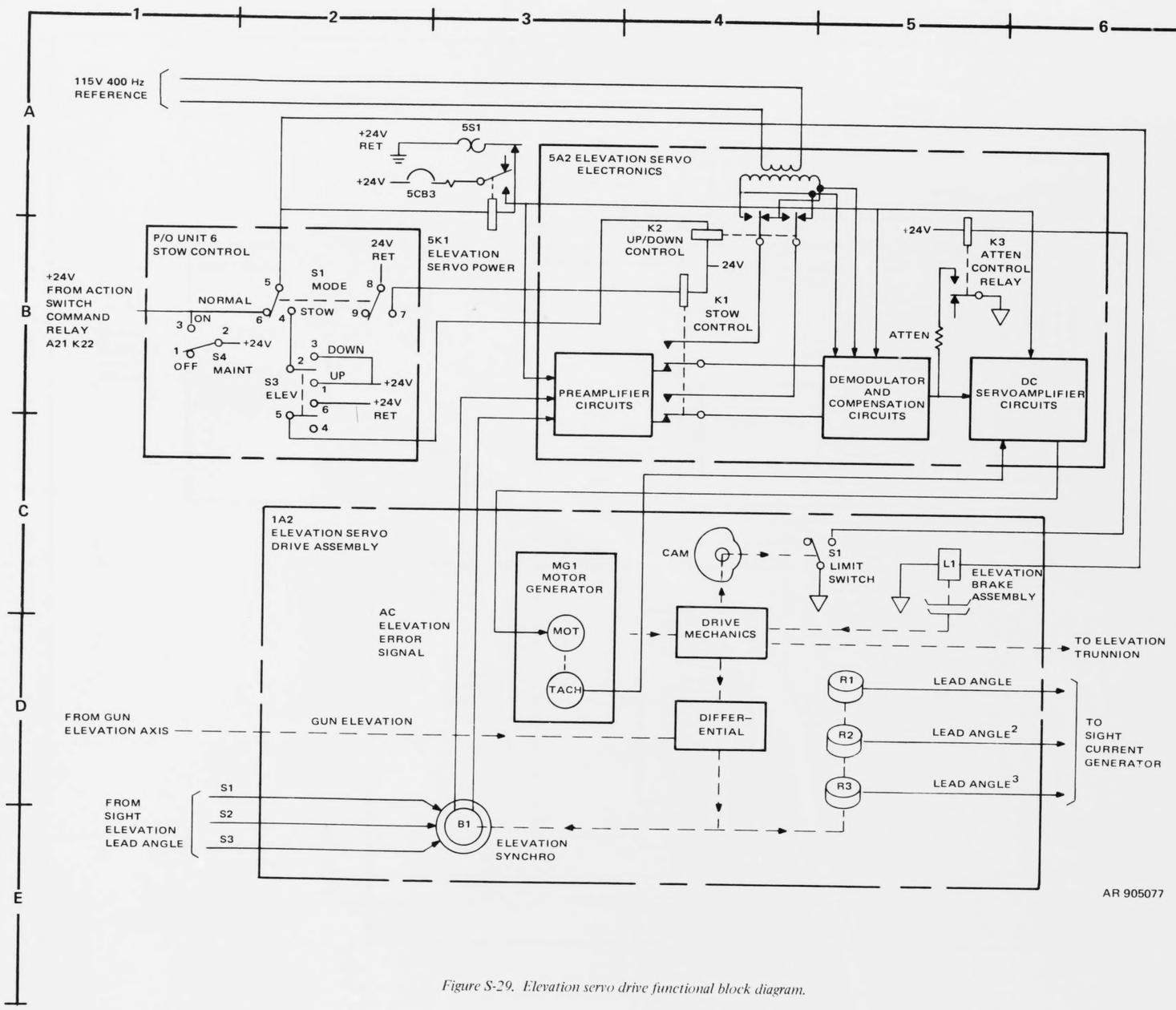


Figure S-29. Elevation servo drive functional block diagram.

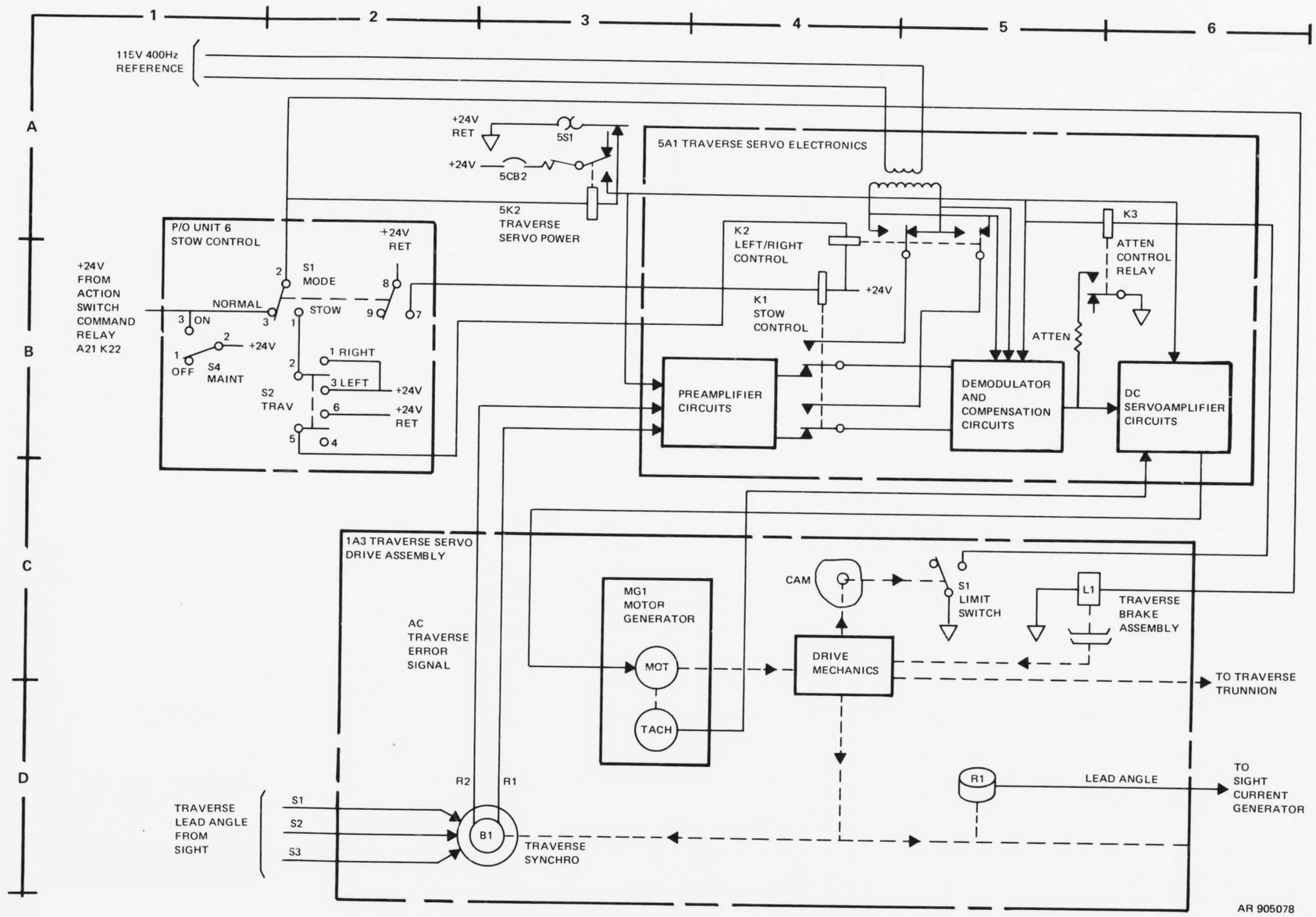


Figure S-30. Traverse servo drive functional block diagram.

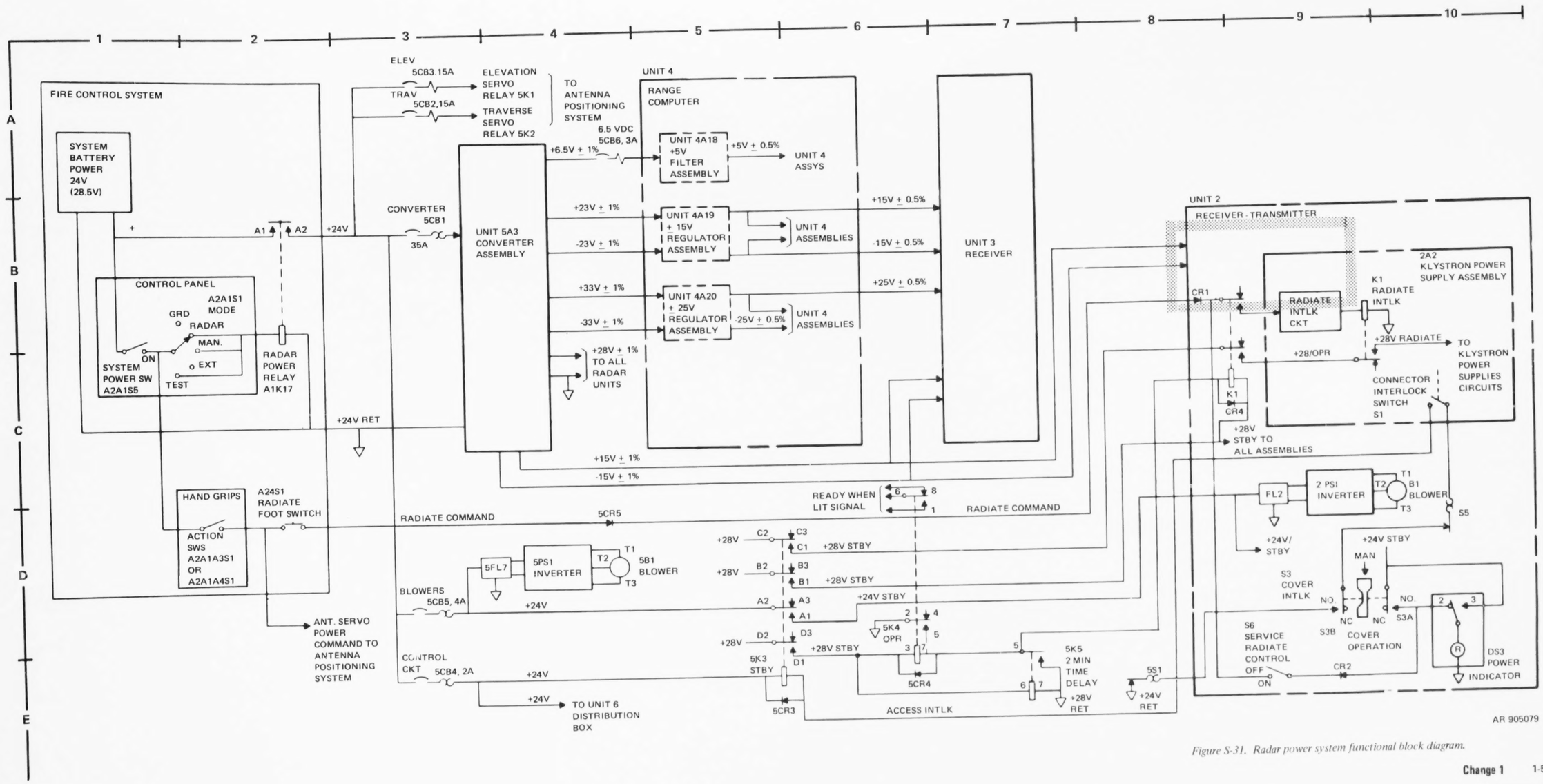


Figure S-31. Radar power system functional block diagram.

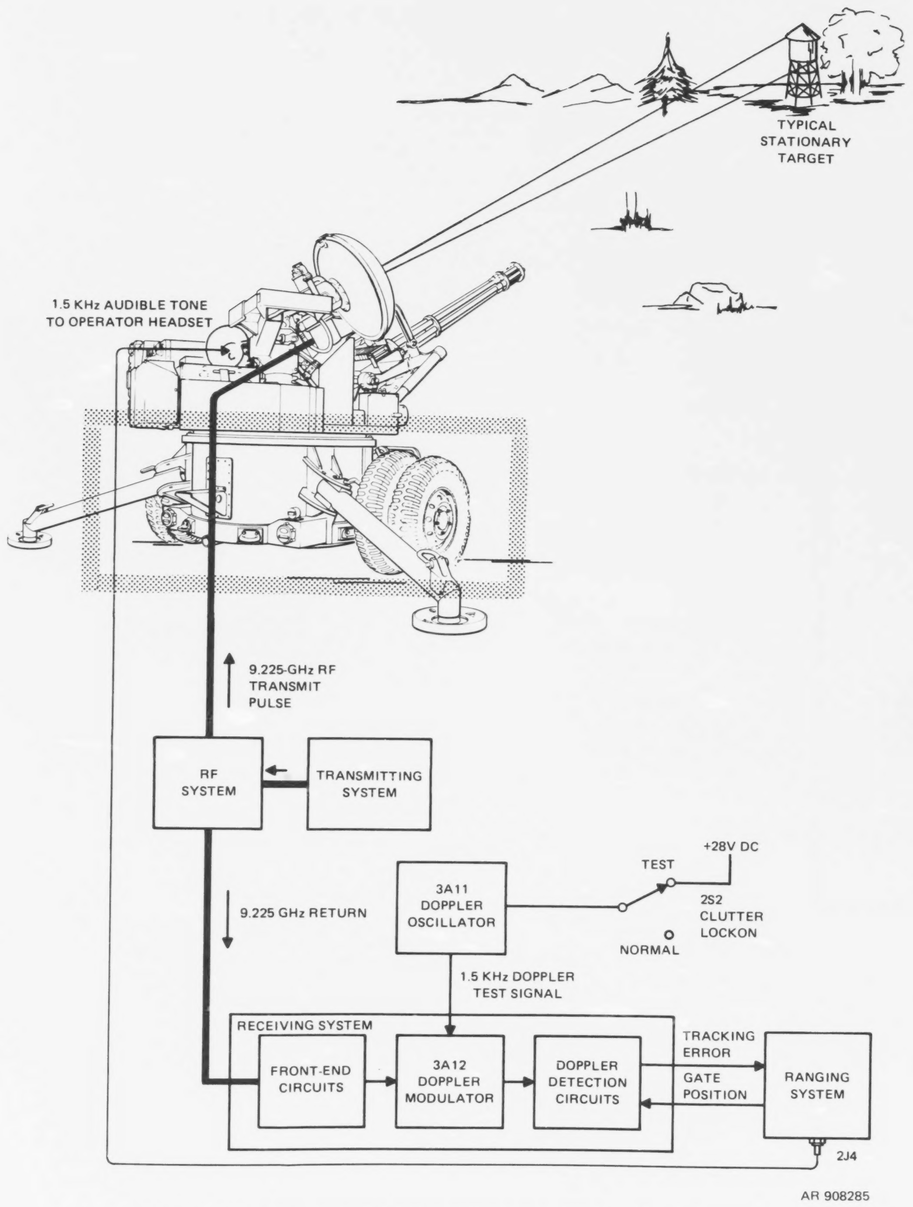


Figure S-32. Radar configuration for clutter lock-on functional block diagram.

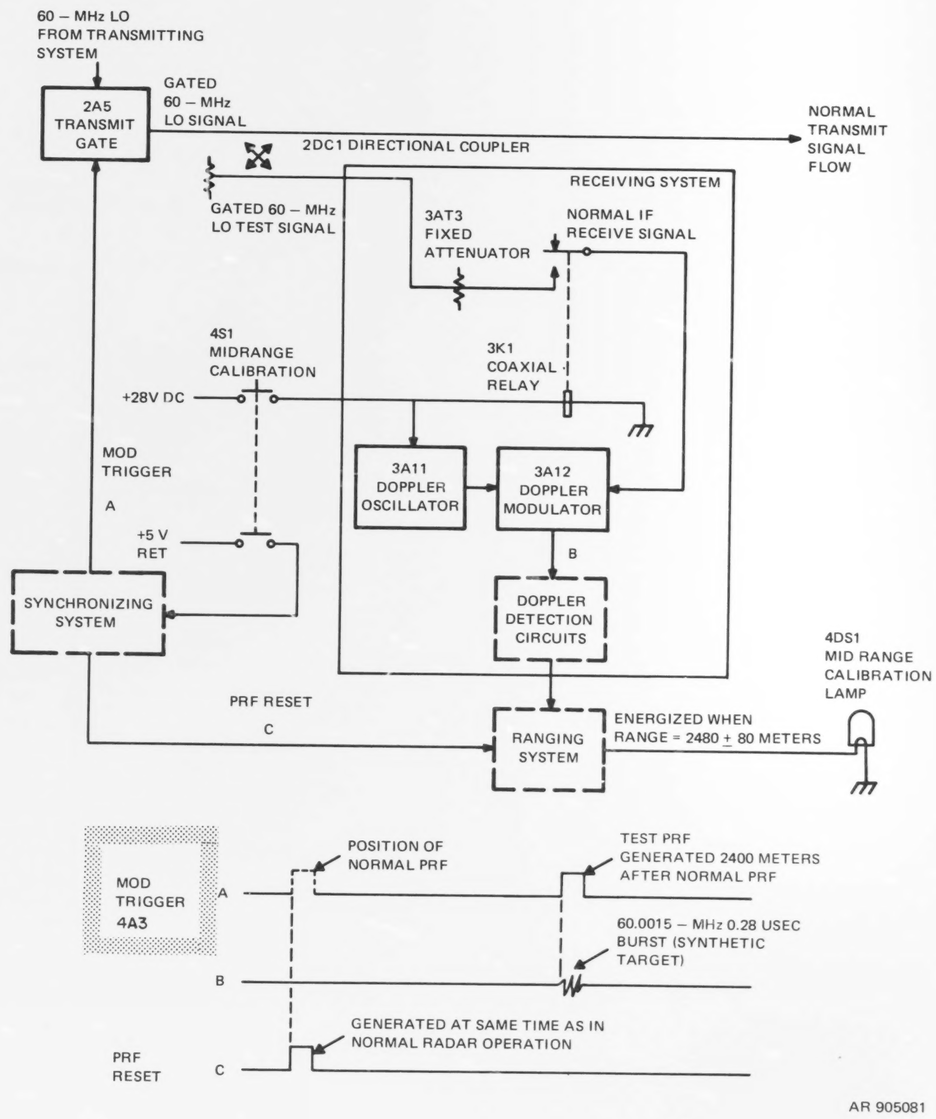


Figure S-33. Radar configuration for midrange calibration functional block diagram.

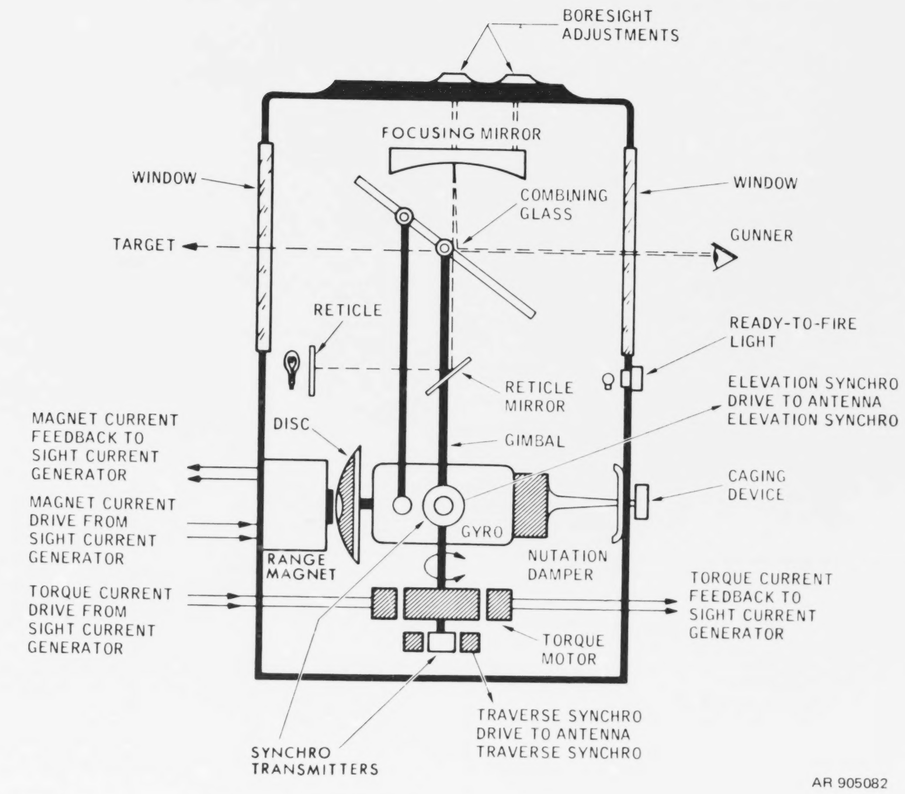


Figure S-34. Sight mechanism diagram.

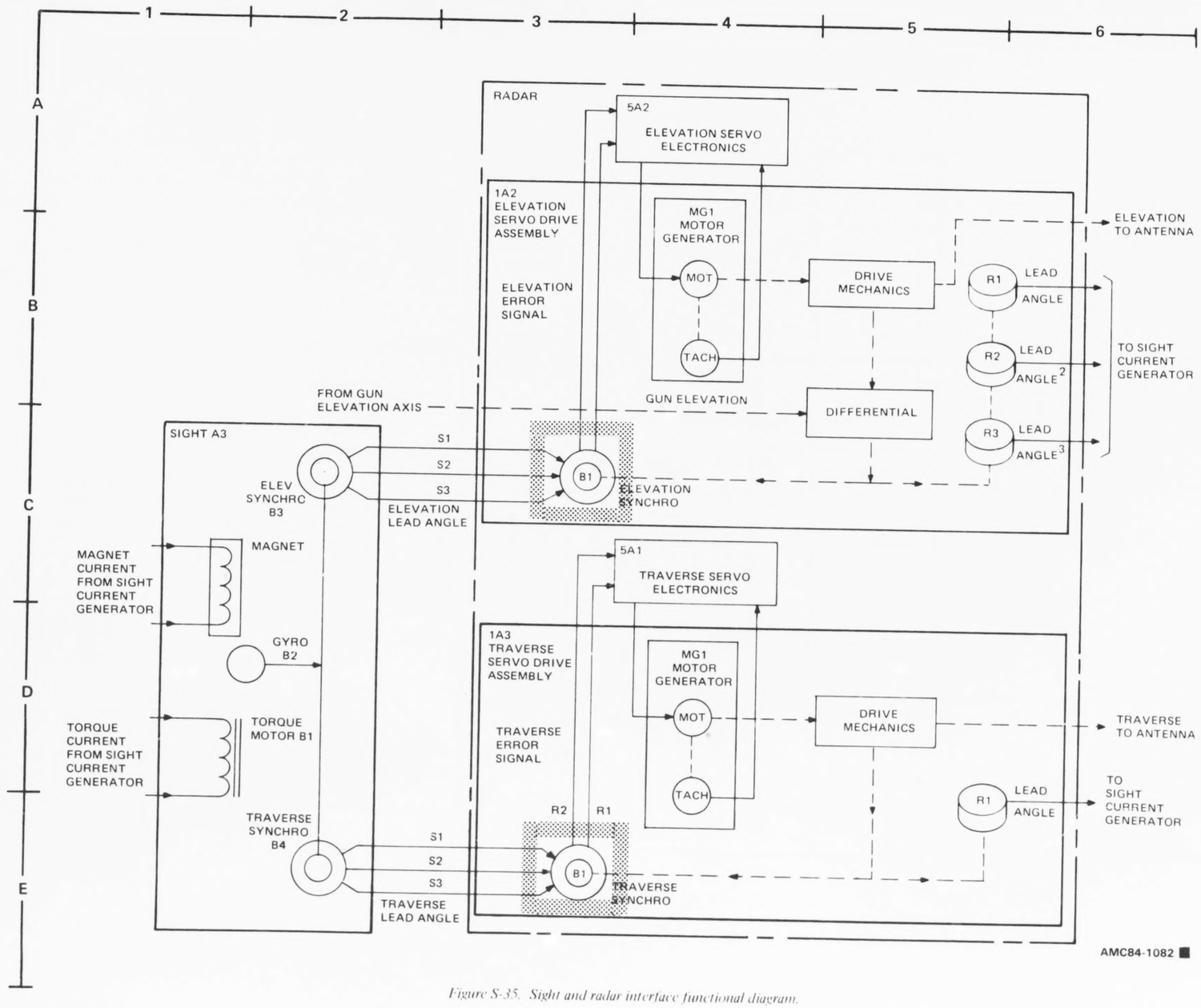


Figure S-35. Sight and radar interface functional diagram.

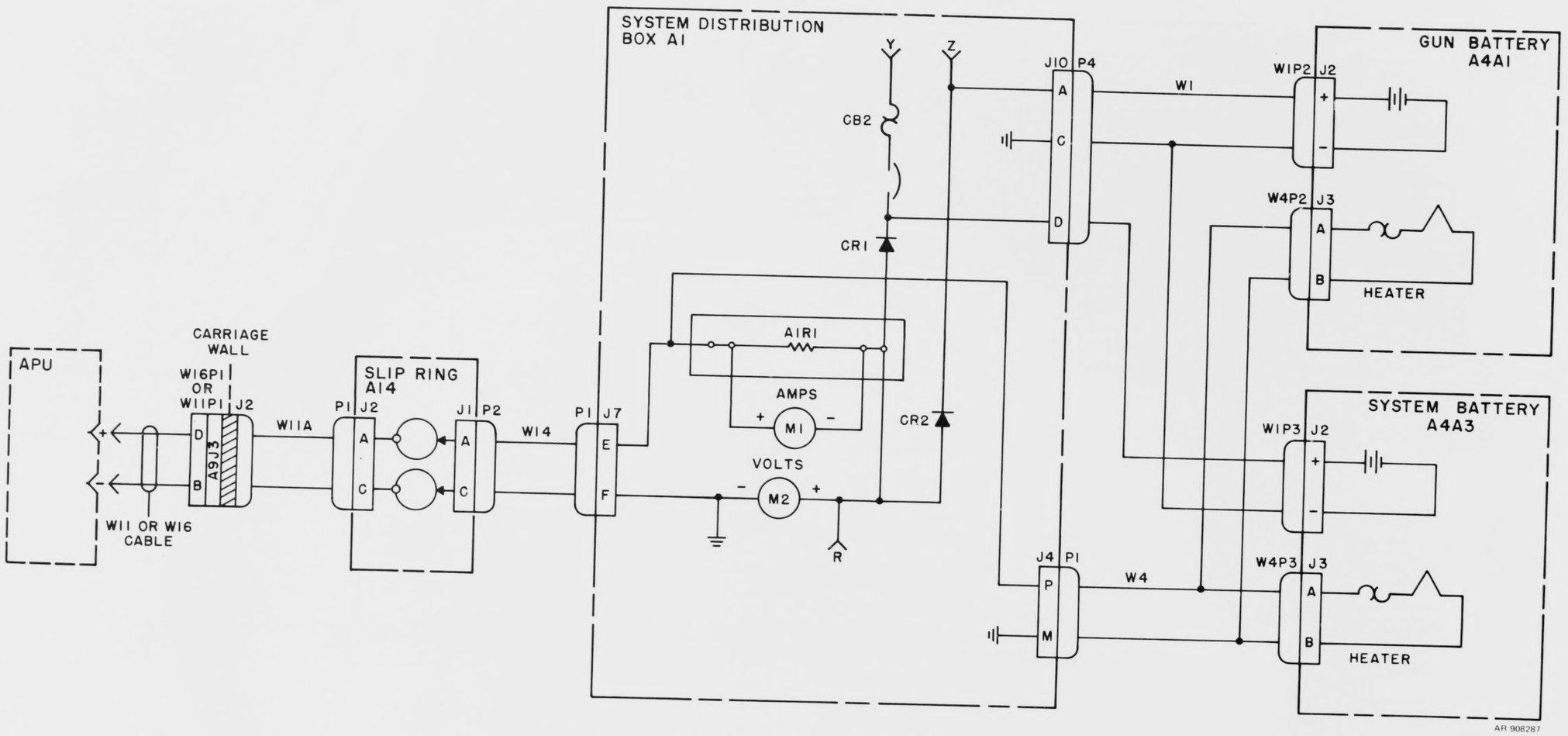
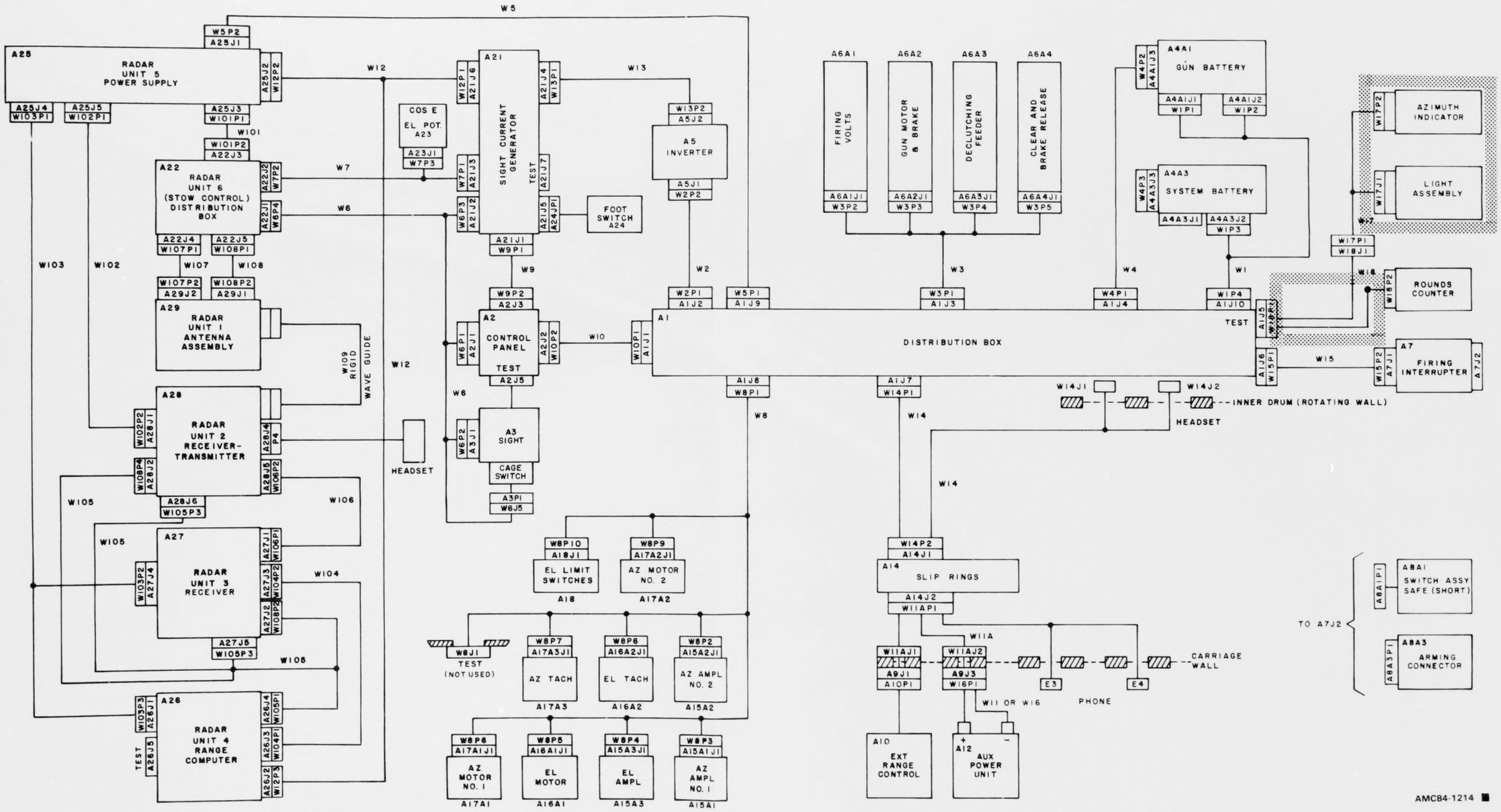


Figure S-36. Battery charging circuit functional diagram.



AMC84-1214 ■

Figure S-37. System simplified interconnection diagram.

NOTES FOR FIGURE S-38

1. The following symbols and the applicable pin letter are used to define test points:
   - ⊗ Distribution Box (A1)
   - ◐ Control Assembly (A2)
   - ○ Sight Current Generator (A21)
2. Circuits are shown with relay coils deenergized and no ammunition in the drum.
3. Polarity data and conventions:
   - a. Motors viewed from brake end.
   - b. Potentiometers (POT) and tachometers (TACH) viewed from shaft end.
   - c. Tachometer polarity shown when driven counterclockwise (CCW).
   - d. Clockwise (CW) and CCW refer to potentiometer, tachometer, and motor rotation.
   - e. Right, left, up and down refer to cannon movement.
4. Battery low rate battery taps are moved to 10.1 volts at or below 32°F.
5. Time delay tolerances:

BURST LIMIT TIMING CIRCUITS-DELAY TIMES AND TOLERANCES

Firing rate switch A2A1S4 position	Firing time (sec)	
	Minimum delay	Maximum delay
LO-NO BURST LIMIT	0.12	0.16
HI-BURST LIMIT - 10 rounds	0.29	0.31
HI-BURST LIMIT - 30 rounds	0.67	0.78
HI-BURST LIMIT - 60 rounds	1.17	1.39
HI-BURST LIMIT - 100 rounds	1.82	2.20

RELAY DROPOUT DELAY TIMES AND TOLERANCES

Relay functions	Relay no.	Time from	Minimum delay (sec)	Maximum delay (sec)
Firing volts	A1K6	Trigger release	0.5	1.0
Low time delay	A1K9	Trigger release	0.14	0.18
Clearing	A1K11	Trigger release	2.0	3.0
Last round (INOPERATIVE)	A1K12			

M167A1 SYSTEM
COMPONENT REFERENCE LIST

COMPONENT REFERENCE DESIGNATION	COMPONENT	ZONE
A1	DISTRIBUTION BOX (see distribution box list for individual components)	49–98
A2	CONTROL PANEL (see control panel list for individual components)	43–48A–J
A3	M61 SIGHT	28-36A, B
A4	BATTERY ASSEMBLY (SYSTEM BATTERY A4A3 and GUN BATTERY A4A1)	7–11A
A5	INVERTER	1G-J
A6	GUN DRIVE ASSEMBLY	3-7A
A6A1	FIRING (VOLTS) PIN (FIRING CONTACT ASSEMBLY)	3A
A6A2	GUN MOTOR AND BRAKE	6A
A6A3	DE-CLUTCHING SOLENOID	4A
A6A4	BRAKE-CLEAR AND BRAKE SWITCH	4, 5A
A7	FIRING INTERRUPTER	1B–E
A7A5	LAST ROUND SWITCH (INOPERATIVE)	
A7A6	ROUNDS COUNTER	72–74B, C
A8A1	ARM-SAFE (SHORT) SWITCH AND LEAD ASSEMBLY	2B
A8A3	ARMING CONNECTOR	1B
A13	AUXILIARY POWER	99–100D

AR 908314

Figure S-38. Detailed interconnection diagram (sheet 1 of 18).

M167A1 SYSTEM
COMPONENT REFERENCE LIST - CONT.

COMPONENT REFERENCE DESIGNATION	COMPONENT	ZONE
A14	SLIP RING ASSEMBLY	99–103G
A15A1	AZ AMPLIFIER 1	86–89A
A15A2	AZ AMPLIFIER 2	81–84A
A15A3	EL AMPLIFIER	78–80A
A16A1	EL MOTOR	77A
A16A2	EL TACHOMETER	90A
A17A1	AZ MOTOR 1	84–85A
A17A2	AZ MOTOR 2	80–81A
A17A3	AZ TACHOMETER	89A
A18	EL LIMIT SWITCHES	95–98A–C
A21	SIGHT CURRENT GENERATOR	9–42D–J
A23	COSINE E POT (ELEVATION POT)	17C
	NOTE AN/VPS-2 Radar set components carry a system component designation and a radar set unit number. The following list identifies the system component designation to the radar unit number.	
A22	(UNIT 6) DISTRIBUTION BOX (commonly referred to as the STOW CONTROL)	18–22A–C
A24	FOOT SWITCH	6J
A25	(UNIT 5) POWER SUPPLY	6, 7E
A26	(UNIT 4) RANGE COMPUTER	6, 7G
A27	(UNIT 3) RECEIVER	4, 5H
A28	(UNIT 2) RECEIVER – TRANSMITTER	4, 5J
A29	(UNIT 1) ANTENNA	19–21A,B
AP35	CAGING SWITCH (and shorting connector)	36 C–D
A3DS1	M61 SIGHT RETICLE LAMP	36B
A3DS2	M61 SIGHT READY-TO-FIRE INDICATOR	35B
	AZIMUTH INDICATOR ASSEMBLY	74, 75E, F
	GUNNER'S LIGHT ASSEMBLY	74, 75D

RELAYS AND THEIR FUNCTIONS

RELAY		FUNCTION
	DISTRIBUTION BOX (A1)	
A1K1	LOADING	Non-functioning circuitry retained for interchangeability reasons.
A1K2	SYSTEM POWER	Applies power to gun control and fire control circuits, and the inverter (A5).
A1K3	ACTION	Applies power to the GUN CLEAR switch A2A1S3, action switch command relay A21K22, and the TRIGGER Switch A2A4S2 circuitry.
A1K4	TURRET POWER	Applies power to the mount control circuitry.
A1K5	TRIGGER	Applies power to the gun motor brake A6A2L1, gun motor high relay A1K8, firing volts relay A1K6, and to the burst limit control circuitry.
A1K6	FIRING VOLTS	Applies firing voltage from the converter A1A3 to the firing (Volts) pin (firing contact assembly) A6A1.
A1K7	BURST LIMIT	Removes power from trigger relay A1K5 when energized by the burst limit circuitry (high rate firing). Deenergizes the gun motor high relay A1K8 when the gun motor has attained the proper low rate speed (low rate firing).
A1K8	GUN MOTOR HIGH	Applies power to A6A2 gun motor when energized by the action and trigger control circuits.
A1K9	TIME DELAY	Energizes gun motor low relay A1K10, thereby applying power to the gun motor during low rate firing. Also keeps A1K10 energized for a short time after trigger is released, thereby allowing the gun to clear.
A1K10	GUN MOTOR LOW	Applies 8.84 vdc to A6A2 gun motor during low rate firing.
A1K11	CLEARING	When energized, applies power to the declutching solenoid A6A3.

AR 908315

Figure S-38. Detailed interconnection diagram (sheet 2 of 18).

RELAYS AND THEIR FUNCTIONS - CONT.

RELAY		FUNCTION
A1K12	LAST ROUND (INOPERATIVE)	
A1K13	ELEVATION LOWER LIMIT	Normally energized, it allows normal cannon movement in elevation except when the mount drives into the -5° limit switch.
A1K14	ACQUISITION TIME DELAY	Energizes when the radar locks on a target then removes most of the azimuth and elevation tachometer feedback, thereby causing the mount and cannon to accumulate the lead angle at a very fast rate. Deenergizes when mount and cannon have accumulated the lead angle. The slew speed (A1K14 energized) is five times normal target tracking speed.
A1K15	RIGHT LIMIT	Energized when system power is on. Not part of active circuitry.
A1K16	LEFT LIMIT	Energized when system power is on. Not part of active circuitry.
A1K17	RADAR POWER	Energized in the radar, manual (MAN) or test modes, it applies 24 vdc primary power to radar power supply (unit 5) A25.
	SIGHT CURRENT GENERATOR (A21)	
A21K21	ELECTRICAL CAGE OFF	When this relay is not activated, the normally-closed position is connected such that the sight is electrically caged. When the relay is activated upon a command signal of the test mode, manual mode, or lockon signals, the relay removes electrical cage and applies a noncaging current.

RELAY		FUNCTION
A21K22	ACTION SWITCH COMMAND	Activates via contacts of action relay A1K3 whenever the mode selector switch A2A1S2 is positioned at RADAR, MAN, or TEST. In RADAR and TEST modes, supplies 24 Vdc to foot switch A24S1; in RADAR, MAN, and TEST modes, supplies 24 Vdc to SCG; and in TEST mode, supplies 24 Vdc to electrical cage off relay A21K21.
A21K23	10-SECOND TIME DELAY	Allows 24 vdc to be applied to the external range control (A10), and 24 vdc to the reticle lamp A3DS1 ten seconds after application of system power. It also applies 19 vdc to the SCG power supply to generate the ± 15 vdc required for the SCG computing circuitry.
A21K24	SIGHT CAGE	Operates in the manual and external modes when the sight cage button is pressed. It removes magnet current to the sight and applies a current which will cage the sight.
A21K25	EXTERNAL MODE	When the MODE switch A2A1S1 switch is set at EXT, A21K25 is activated. When A21K25 is activated, the current supplying the M61 sight is switched from the current modules to the external range control A10.
A21K26	MANUAL MODE	When the MODE switch A2A1S1 is set at MAN, A21K26 is activated and switches the range and range rate input signals to the manually set range and range rate signals at the control panel.
A21K27	READY-TO-FIRE	Upon a command signal from the action switch, A21K27 is activated, which allows the ready-to-fire light A3DS2 to come on (after closure of the action switch) when the various ready-to-fire logic circuits have been completed.

AR 908316

Figure S-38. Detailed interconnection diagram (sheet 3 of 18).

A1 DISTRIBUTION BOX
COMPONENT REFERENCE LIST

A1 DISTRIBUTION BOX		ZONE
K1	LOADING (NON-FUNCTIONING)	67B
K2	SYSTEM POWER	51, 52E
K3	ACTION	53G-J
K4	TURRET POWER	81D, E
K5	TRIGGER	54G
K6	FIRING VOLTS	54C
K7	BURST LIMIT	55G-J
K8	GUN MOTOR HIGH	65B
K9	TIME DELAY	56F
K10	GUN MOTOR LOW	64B
K11	CLEARING	58F
K12	LAST ROUND (INOPERATIVE)	58G, H
K13	ELEVATION LOWER LIMIT	83, 84E
K14	ACQUISITION TIME DELAY	85E
K15	RIGHT LIMIT	82G
K16	LEFT LIMIT	84, 85G
K17	RADAR POWER	53B

A1 DISTRIBUTION BOX COMPONENTS		ZONE
A3	CONVERTER	56B
A4	FILTER	50F, G
C1		62B
C2		55B
C3		81D
CB1	SCG POWER	51F
CB2	SYSTEM POWER	53E
CB3	INVERTER POWER	51E
CB4	SIGHT GYRO POWER	51B
CB6		82D
CB7		82D
CB8		82D
CR1		69D
CR2		69C
CR3		67C
CR4		57B
CR5		56B
CR6		66B
M1	AMPS	69C
M2	VOLTS	69C
M3	ELAPSED TIME INDICATOR	50F
R1	SHUNT	70C
R2		63B
R3		55C
R4		55B
S1	NORM-STATIC-TEST SWITCH	82D, E

AR 908317

Figure S-38. Detailed interconnection diagram (sheet 4 of 18).

A1 Distribution Box Test Points

The distribution box of the mount electronics has test points which monitor various signals within the unit. These various voltages are brought out to a common test jack (A1J5) readily accessible at the lower-left side of the distribution box. However, you can use cable W33 of the **AN/MWM-3** Test Set as an extender cable for ease in taking the measurements. The following distribution box test point data list gives the signals measured and displays the test point symbol for the distribution box (A1).

A1 Distribution Box Test Point Data

Pin of A1J5	Zone	Signal or Voltage Measured
A	68C	+8.84 Vdc lo gun motor voltage
B	64C	Gun motor voltage A6A2: +24 Vdc in hi rate, +8.84 Vdc in lo rate
C	56H	+24 Vdc when burst limit relay A1K7 energized
D	52D	+24 Vdc fire pulse when action switch and trigger on control panel pressed (trigger signal to arm-safe switch or arming connector)
E	58D	+24 Vdc fire pulse to trigger relay A1K5 through arm-safe switch or arming connector
F	56J	+24 Vdc until burst limit circuit times down selected by BURST LIMIT switch on control panel (energizing voltage for burst LIMIT relay K7)
G	63D	(Not used – Formerly 24 VDC to A1K12)
H	57D	+24 Vdc to release gun brake solenoid
J	56D	+24 Vdc to cut off ammo flow when clearing gun (clearing solenoid power)
K	84E	+24 Vdc to lower limit relay K13 when gun approaches -5^{o} low limit
L	97F	+24 Vdc to right limit relay K15 when power is on (not part of active circuitry)
M	86E	+24 Vdc to left limit relay K16 when power is on (not part of active circuitry)
N	67C	+8.84 lo gun motor voltage
P	53B	+24 Vdc when radar power relay A1K17 energized (system power to radar)
R	69B	Across plus side of VOLTS meter A1M2 (external power)
S	68J	+330 Vdc to firing contact when A1K6 energized (gun firing voltage)
T	81F	+24 Vdc for turret power enable relay A1K4
U	50B	115 Vac 400 Hz phase B from inverter A5
V	50B	115 Vac 400 Hz phase A from inverter A5
W	50B	115 Vac 400 Hz phase C from inverter A5
X	66C	+24 Vdc loading command input signal to A1K1 (non-functioning circuitry retained for interchangeability reasons)

A1 Distribution Box Test Point Data - Continued

Pin of A1J5	Zone	Signal or Voltage Measured
Y	50E	+24 Vdc system power through A1CB2
Z	68C	+24 Vdc gun motor voltage
a	85F	Acquisition time delay relay enable voltage for A1K14
b	50G	+24 Vdc auto gun clear pulse through action relay A1K3
c	52B	115 Vac 400 Hz single phase from inverter
d	52C	115 Vac 400 Hz single phase return
e	69B	Ground
f	58H	Non-functioning circuitry retained for interchangeability reasons
g	68F	+24 Vdc to clearing time delay circuits
h	65B	+24 Vdc pulse to hi gun motor A1K8, pulse duration depends on burst limit selected
i	66B	+24 Vdc while loading relay A1K1 energized (loading motor power)
j	64C	+24 Vdc to low gun motor relay A1K10
k	51E	+24 Vdc system power input from control panel to A1K2
m	55C	+330 Vdc firing voltage from converter A1A3
n	58F	+24 Vdc while clearing relay A1K11 not energized
p	54E	+24 Vdc to energize firing volts relay A1K6 time delay (+24 Vdc = relay K6 deenergized)
q	57G	+24 Vdc until lo time delay expires to permit gun to accelerate rapidly at first
r	58H	Not used
s	58G	+24 Vdc to trigger relay A1K5: pulse with A1K7 energized in hi rate; constant in lo rate as long as trigger held
t	56G	+24 Vdc starts lo time delay circuit for energizing time delay relay A1K9. (High gun motor relay A1K8 energized before burst limit)

AR 908318

Figure S-38. Detailed interconnection diagram (sheet 5 of 18).

A2 CONTROL PANEL
COMPONENT REFERENCE LIST

A2 CONTROL PANEL INDICATORS		ZONE
A2A1DS1	SYSTEM POWER	110F
A2A1DS2	GUN POWER	110F
A2A1DS3	GOOD WHEN LIT	106F
A2A1DS4	READY WHEN LIT	106F
A2A1DS5	LOW VOLTAGE WARNING	110G

A2 CONTROL PANEL SWITCHES		ZONE
A2A1S1	MODE SELECTOR SWITCH	
	DECK A	107-108D
	DECK B	109-111D
	DECK C	117-119C
A2A1S2	GUN POWER SWITCH	116E
A2A1S3	GUN CLEAR SWITCH	120C
A2A1S4	FIRING RATE BURST LIMIT SWITCH	120-123H
A2A1S5	SYSTEM POWER SWITCH	110E
A2A1S6	RIGHT LIMIT SWITCH	118D
A2A1S7	LEFT LIMIT SWITCH	118D
A2A1S8	LOW VOLTAGE TEST/ OVERRIDE SWITCH	111H
A2A3S1 AND A2A4S1	ACTION SWITCHES	108E 108F
A2A3S2	SIGHT CAGE BUTTON	107E
A2A4S2	TRIGGER SWITCH	109H

A2 CONTROL PANEL		ZONE
A2A1A1R7	FIXED RESISTOR (LO RATE FIRE)	122G
A2A1G1	AZ AIDED LAYING TACH	123B
A2A1M1	ELAPSED TIME INDICATOR	121B
A2A1R1	SIGHT LAMP (M61) POT	110B
A2A1R2	FIXED RESISTOR	109B
A2A1R3	RANGE POT	106E
A2A1R4	TARGET SPEED POT	106F
A2A1R5	100 ROUND BURST POT	120H
A2A1R6	60 ROUND BURST POT	120G
A2A1R7	30 ROUND BURST POT	120G
A2A1R8	10 ROUND BURST POT	121G
A2A1R10	AZ HAND CONTROL POT	120D
A2A2G1	EL AIDED LAYING TACH	110H
A2A2R1	EL HAND CONTROL POT	116G

A2 Control Panel Test Points

Test points on the control panel permit you to monitor various input and output signals of the control panel. These signals are brought out to a common test jack (A2J5) for measurement. This test jack is located at the bottom right front, next to A2J2. For ease in making the specified measurements, you can use cable W31 of the AN/MWM–3 Test Set as an extender cable. The following control panel test point data list gives the signals measured and displays the test point symbol for the control panel (A2).

A2 Control Panel Test Point Data

Pin of A2J5	Zone	Signal or Voltage Measured
A	110B	+24 Vdc for sight reticle brightness circuit
B	109C	Manual mode selected for sight current generator (+24 Vdc)
C	109D	+24 Vdc system power input to mode selector switch
D	117F	Elevation control
E	106K	External mode ready to fire command input to sight current generator
F	118G	Elevation control
G	105D	Sight cage command from hand grip
H	117F	Elevation control
J	105K	External mode range estimate input to sight current generator
K	122D	Azimuth control
L	108H	115 Vac 400 Hz single phase return from inverter via distribution box
M	119D	Azimuth control
N	108H	115 Vac 400 Hz single phase from inverter via distribution box
P	119D	Azimuth control
R	122B	Elapsed time indicator voltage (+24 Vdc when system power is on)
S	106C	+24 Vdc to 10-second delay circuit in sight current generator
T	108B	+24 Vdc to energize radar power in distribution box
U	108G	+24 Vdc when action switches closed to sight current generator
V	110J	+24 Vdc trigger voltage to firing circuit
W	110J	+24 Vdc trigger voltage in from distribution box
X	117D	System power input to control panel
Y	105E	Manual range voltage to sight current generator
Z	106F	Manual target speed voltage to sight current generator
a	106K	Cannon elevation less than 80° for ready-to-fire circuit
b	120J	Firing rate burst limiting output to distribution box
c	118J	Firing rate burst limit circuit input voltage

AR 908319

Figure S-38. Detailed interconnection diagram (sheet 6 of 18).

A21 SIGHT CURRENT GENERATOR
RELAY REFERENCE LIST

A21K21
ELECTRICAL CAGE OFF

CONTACT	ZONE
COIL	42F
A	25F
B	25H

A21K22
ACTION SW COMMAND

CONTACT	ZONE
COIL	41D
A	19G
B	9J
C	10D
D	41D

A21K23
10-SEC TIME DELAY

CONTACT	ZONE
COIL	40D
A	40C
B	27D
C	40C
D	40D

A21K24
SIGHT CAGE

CONTACT	ZONE
COIL	32G
A	32F
B	41F
C	32F

A21K25
EXTERNAL MODE

CONTACT	ZONE
COIL	33D
A	27E
B	29G
C	34E
D	32D
E	32D
F	31D

A21K26
MANUAL MODE

CONTACT	ZONE
COIL	31F
A	31F
B	10F
C	10H
D	12H
E	10G
F	10G

A21K27
READY-TO-FIRE

CONTACT	ZONE
COIL	41D
A	41D

◯ A21 Sight Current Generator Test Points

The sight current generator is provided with test points that monitor the various signals in the unit. These signals are brought out to a common test jack (A21J7) readily accessible on the side of the unit. However, you may use cable W32 of the AN/MWM-3 (OMTS) as an extender cable for ease in taking the measurements. The following sight current generator test point data list gives the signals measured and displays the test point symbol for the sight current generator (A2¹

◯ A21 Sight Current Generator Test Point Data

(NOTE: Test points displayed on figure S-38 are identified with zone designation in this list. Other test points are referenced to an appropriate figure number.)

Pin of A21J7	Zone	Signal or Voltage Measured
A	19G	115 Vac 400 Hz
B	19G	115 Vac 400 Hz return
C	33F	+24 Vdc (to 10-second time delay K23 excitation)
D	21F	$\lambda^2 T$ from antenna traverse circuit
E	19E	$\lambda^2 E$ from antenna elevation circuit
F	40G	Radar lock on signal (track) (OV = LOCKON; 15V = NO LOCKON)
G	29E	Radar encountering ECM (ECM = OV; NO ECM = +13V)
H	9G	-10 Vdc inbound range rate reference signal from radar
J	9F	+10 Vdc outbound range rate reference signal from radar
K	10H	+20 Vdc range reference signal
L	10E	Radiate command from foot switch to radar (+24V to radiate)
M	40G	Radar 2-minute time delay expired signal (Radar ready: +24V when on)
N	29D	Azimuth phase A synchro test point
P	29D	Azimuth phase B synchro test point
R	30D	Azimuth phase C synchro test point
S	29D	Elevation phase A synchro test point
T	29D	Elevation phase B synchro test point
U	29D	Elevation phase C synchro test point
		} Sight synchro 0-90V RMS, 400 H_z
V	34D	Sight torque motor feedback signal $f(I_T)$
W	33E	Sight magnet current feedback signal $f(I_M)$
X	9E, H	Ground
Y	26E	-15 Vdc
Z	35H	+15 Vdc
a	17E	Cosine of elevation signal from Cos E potentiometer
b	40C	Ready-to-fire signal to sight lamp (OV when on)
c	19E	$\lambda^3 E I_M^2$ torque current (second term)
d	33G	Sight cage command signal (+24V to sight cage A21K24)
e	41D	Ready-to-fire relay A21K27 actuation signal (+24V with action switch)

AMC84-1083 ■

Figure S-38. Detailed interconnection diagram (sheet 7 of 18).

A21 Sight Current Generator Test Point Data - Cont.

Pin of A21J7	Zone	Signal or Voltage Measured
f	Fig S-14	Range is less than 2200 meters signal for ready-to-fire = +15 Vdc
g	Fig S-9	Sight magnet current module VI_M input (0 to +13 Vdc)
h	Fig S-11	Sight torque current module VI_T input (-13 to +13 Vdc)
i	Fig S-9	Range air density reference voltage (-3.4 Vdc)
j	Fig S-9	Muzzle velocity (MV) magnet current fifth term
k	Fig S-9	Muzzle velocity (MV) magnet current fifth term
m	Fig S-9	+1/RN magnet current first term
n	Fig S-9	$-\lambda^2/R$ magnet current fourth term
p	Fig S-11	Super elevation (SUPER EL) torque current third term
q	Fig S-9	Divider reference
r	Fig S-9	Buffered range reference (+R')
s	Fig S-9	$+R/R^2$ magnet current third term
u	Fig S-9	$-\dot{R}/R$ magnet current second term
v	41C	Test mode low calibration signal (GO = 15Vdc, NOGO = 0)
w	41C	Test mode high calibration signal (GO = 15 VDC, NOGO = 0)
x	10G, S-9	Range signal from radar (Range input to sight current generator)
y	Fig S-13 Fig S-14	Range signal (buffered) 0.834 (Range input)
z	28G	+24 Vdc acquisition time delay pulse from A1K14
AA	10F, S-9	Range rate signal from radar (Range rate input signal to sight current generator)
BB	20E, Fig S-11	$+KI_M^2$ signal to the λ^3 pot
CC	Fig S-14	Acquisition time delay signal
DD	Fig S-18	Sight magnet current feedback fI_M (buffered)
EE	Fig S-11	$-KI_M^2\lambda^2$ signal (input to amplifier for λ_E pot excitation)
FF	Fig S-9 Fig S-14	λ^2 signal from antenna
GG	Fig S-11	26 V P-P serrasoid (AC)
HH	32F	Sight cage command from hand grip (+24 Vdc when sight caged)

AR 906321

Figure S-38. Detailed interconnection diagram (sheet 8 of 18).

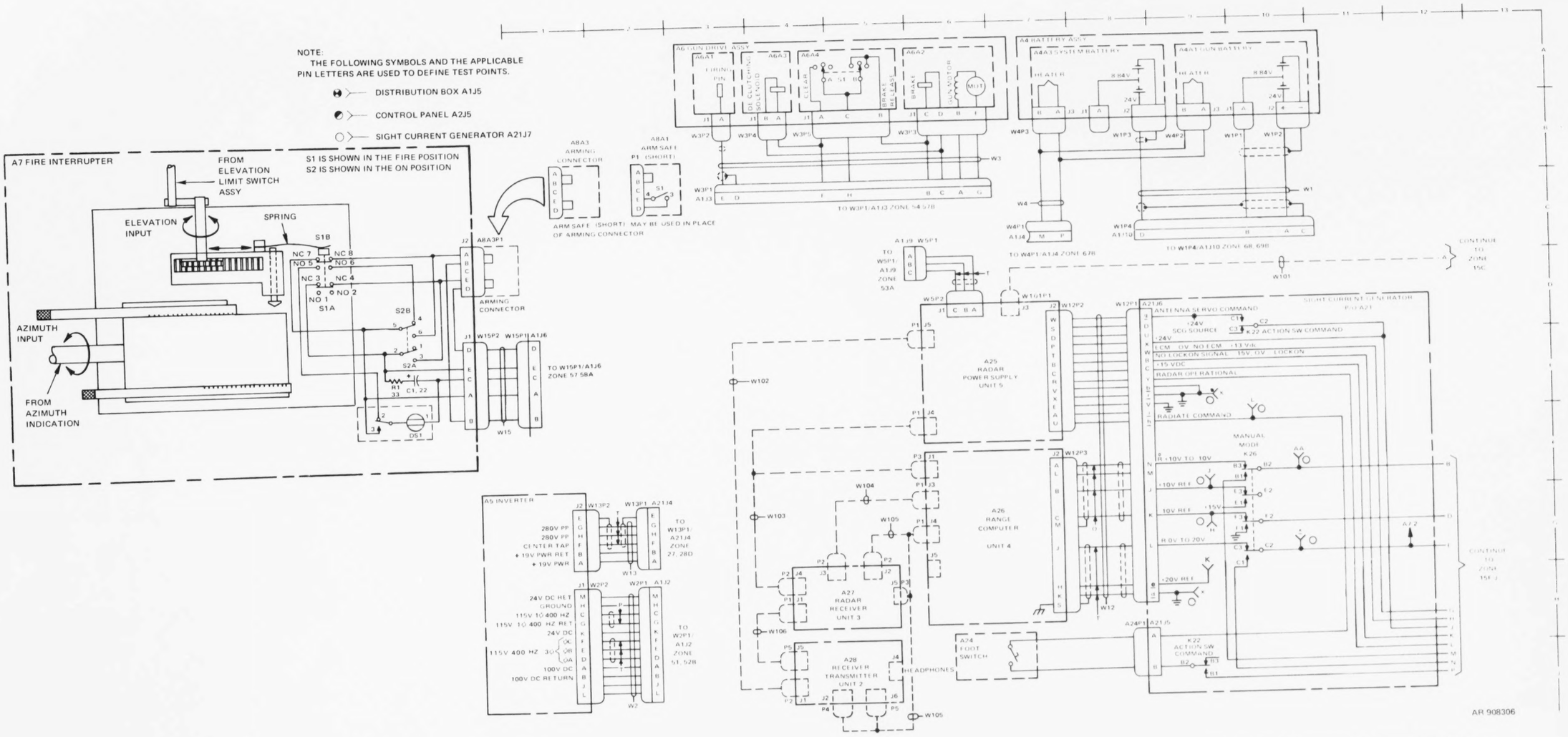


Figure S-38. Detailed interconnection diagram (sheet 9 of 18).

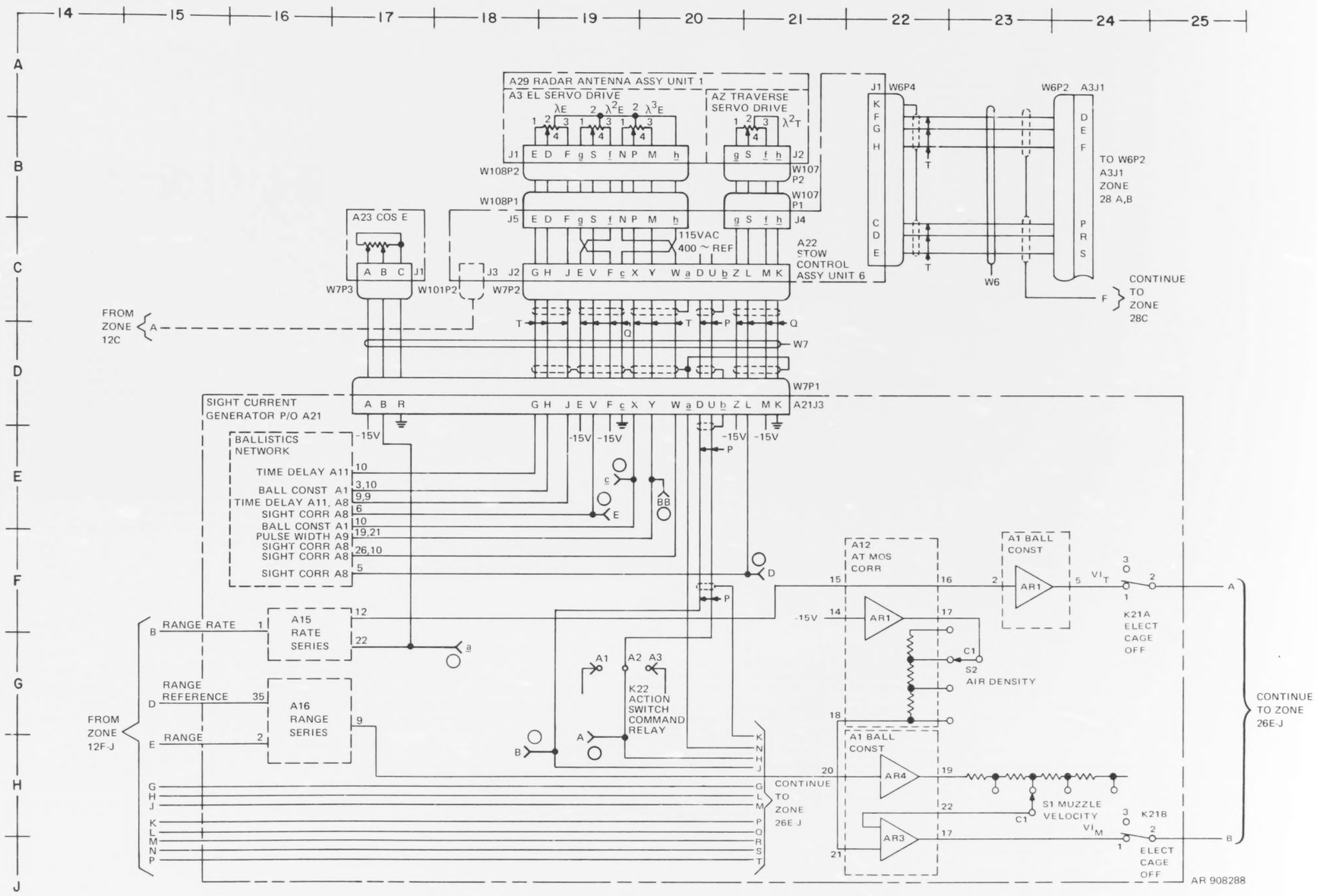

14 15 16 17 18 19 20 21 22 23 24 25
A B C D E F G H J
A29 RADAR ANTENNA ASSY UNIT 1
A3 EL SERVO DRIVE
AZ TRAVERSE SERVO DRIVE
λE 2 λ²E 2 λ³E
λ²T
J1 E D F g S f N P M h J2
W108P2
W107 P2
W108P1
W107 P1
J5 E D F g S f N P M h J4
g S f h
A23 COS E
A B C J1
W7P3
W101P2
J3 J2 G H J E V F c X Y W a D U b Z L M K
A22 STOW CONTROL ASSY UNIT 6
115VAC 400 ~ REF
J1 W6P4
K F G H C D E
W6P2 A3J1
D E F P R S
TO W6P2 A3J1 ZONE 28 A,B
W6
CONTINUE TO ZONE 28C
FROM ZONE 12C
W7
W7P1
A21J3
SIGHT CURRENT GENERATOR P/O A21
A B R
G H J E V F c X Y W a D U b Z L M K
-15V
BALLISTICS NETWORK
TIME DELAY A11 10
BALL CONST A1 3,10
TIME DELAY A11, A8 9,9
SIGHT CORR A8 6
BALL CONST A1 10
PULSE WIDTH A9 19,21
SIGHT CORR A8
SIGHT CORR A8 26,10
SIGHT CORR A8 5
A15 RATE SERIES
RANGE RATE 1
12
22
A16 RANGE SERIES
RANGE REFERENCE 35
RANGE 2
9
FROM ZONE 12F-J
A1 A2 A3
K22 ACTION SWITCH COMMAND RELAY
CONTINUE TO ZONE 26E-J
A12 AT MOS CORR
AR1
A1 BALL CONST
AR4
AR3
S1 MUZZLE VELOCITY
S2 AIR DENSITY
K21A ELECT CAGE OFF
K21B ELECT CAGE OFF
CONTINUE TO ZONE 26E-J
AR 908288

Figure S-38. Detailed interconnection diagram (sheet 10 of 18).

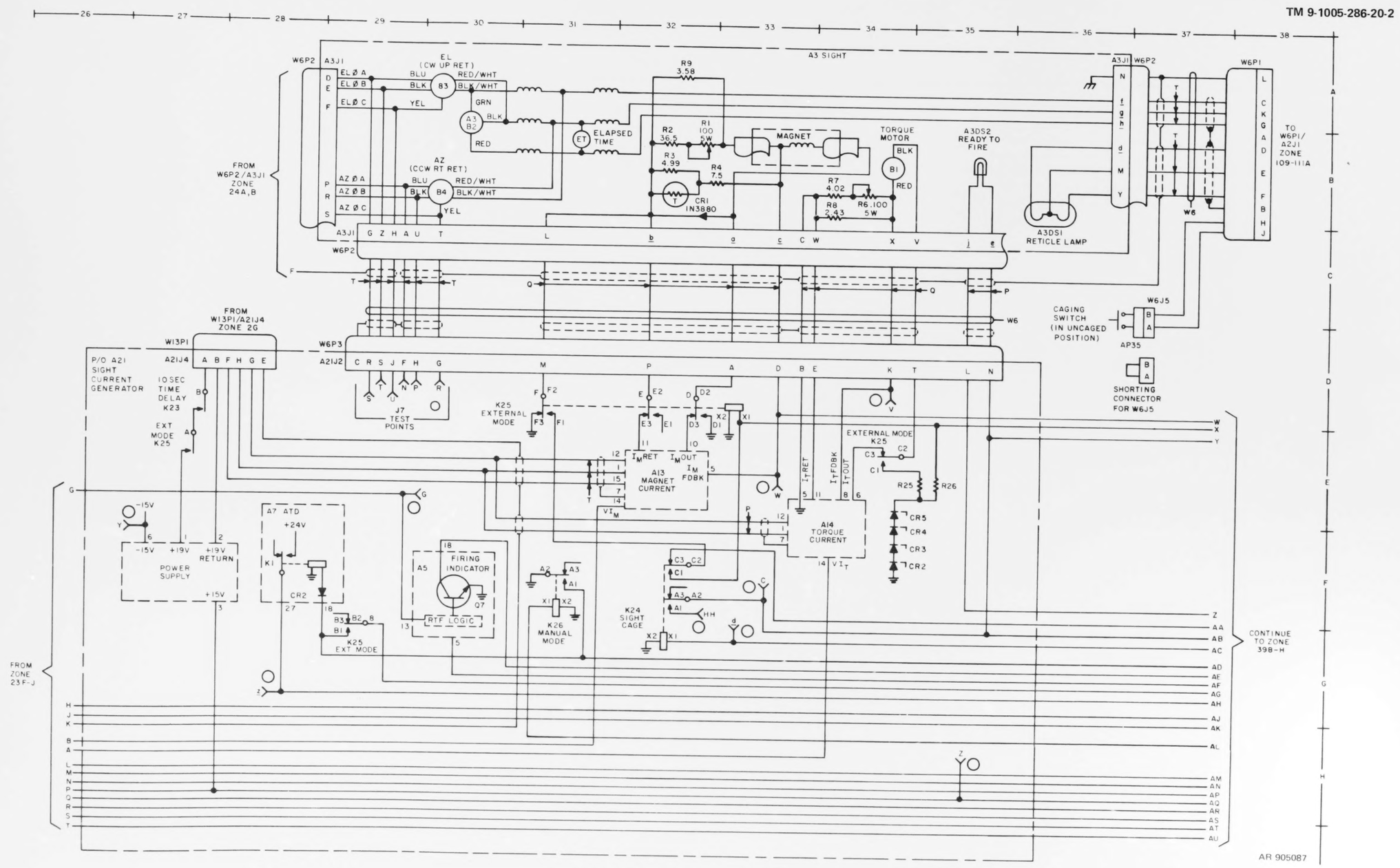


Figure S-38. Detailed interconnection diagram (sheet 11 of 18).

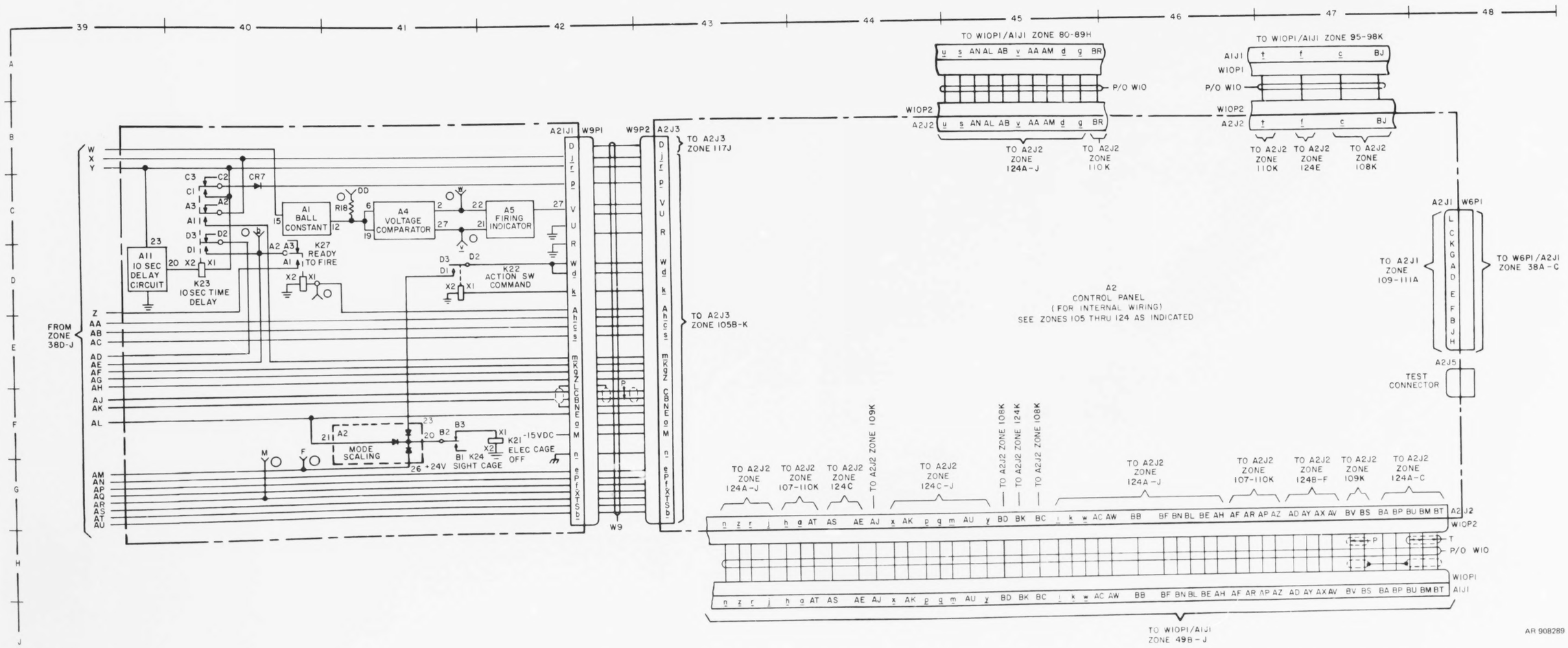


Figure S-38. Detailed interconnection diagram (sheet 12 of 18).

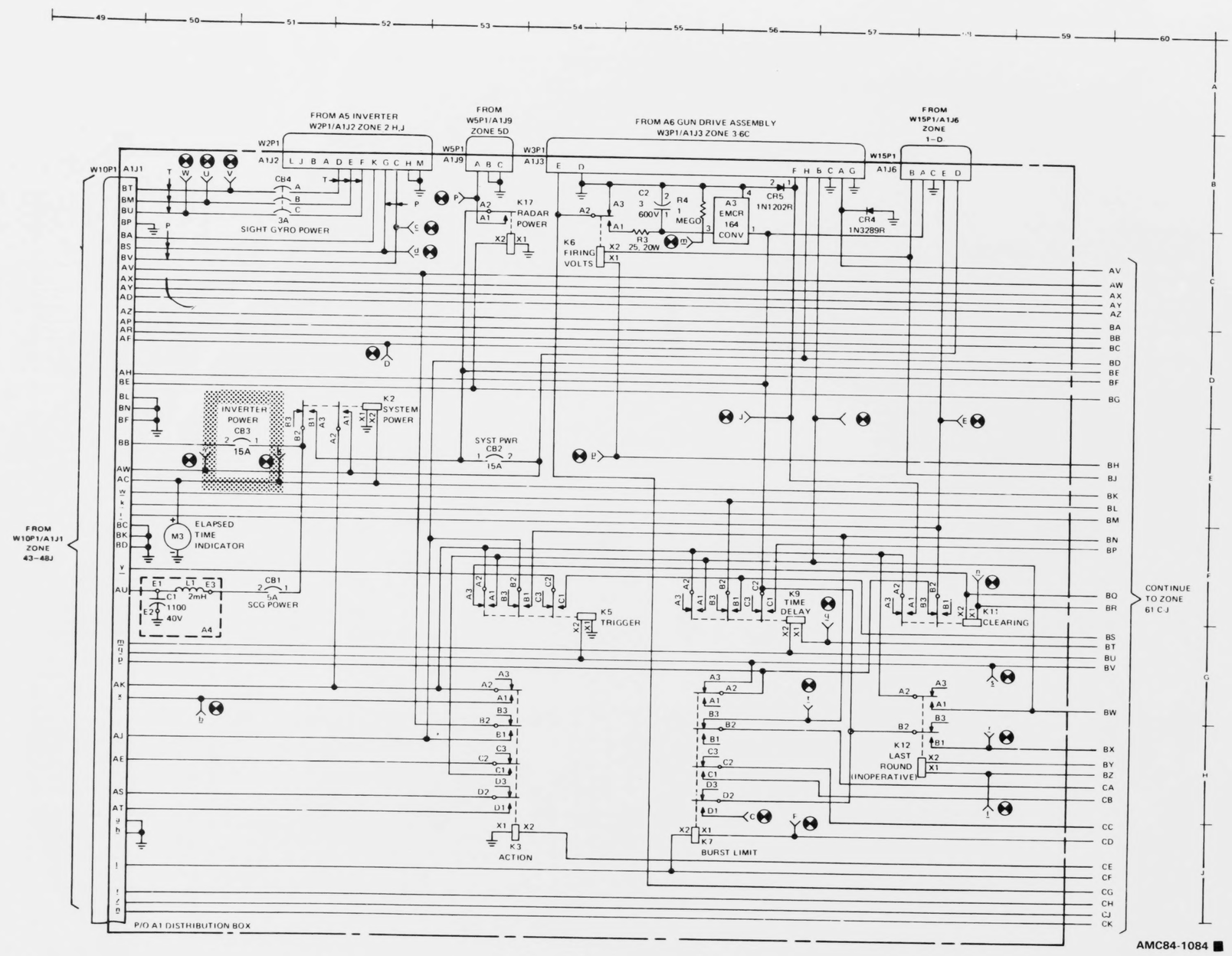


Figure S-38. Detailed interconnection diagram (sheet 13 of 18).

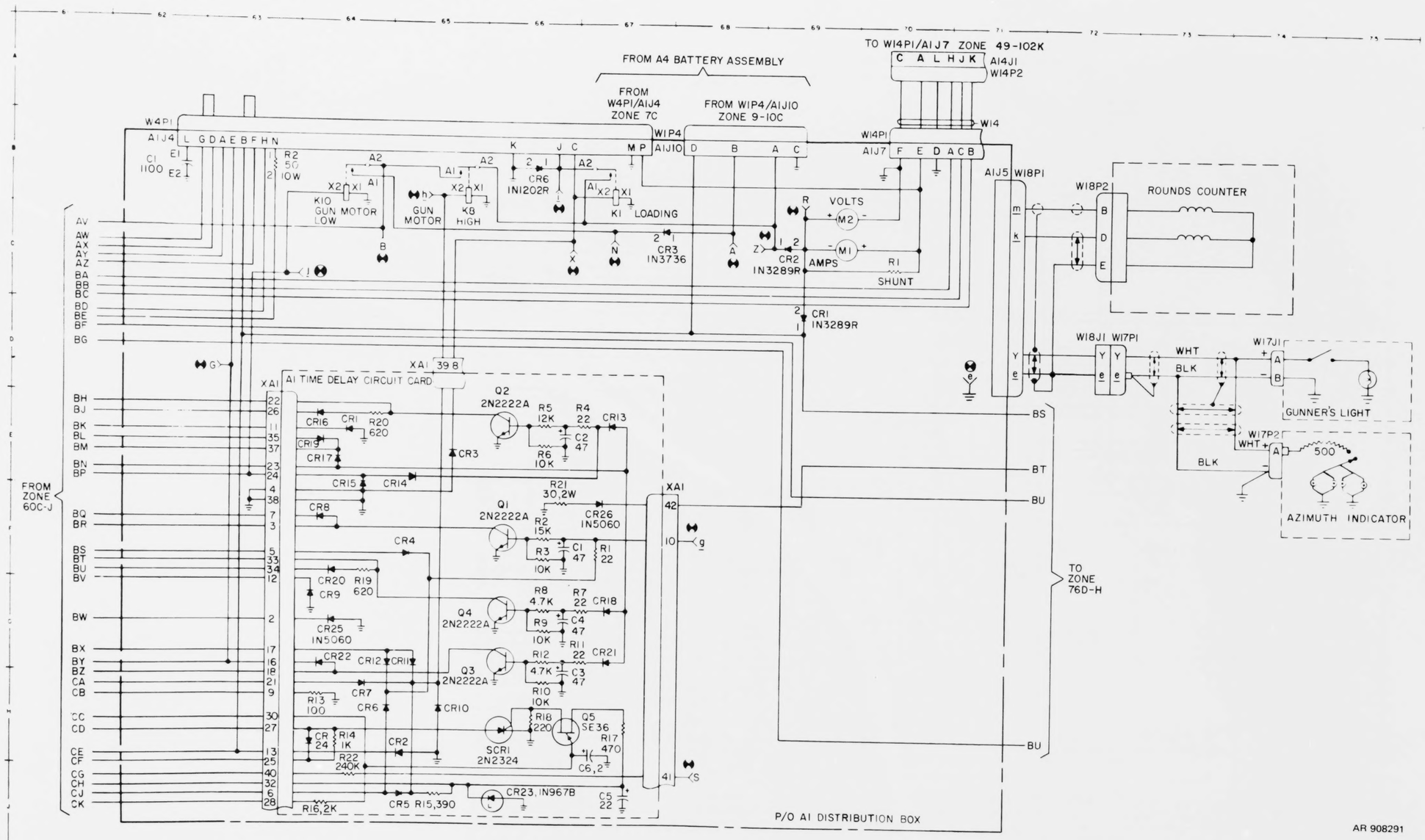


Figure S-38. Detailed interconnection diagram (sheet 14 of 18).

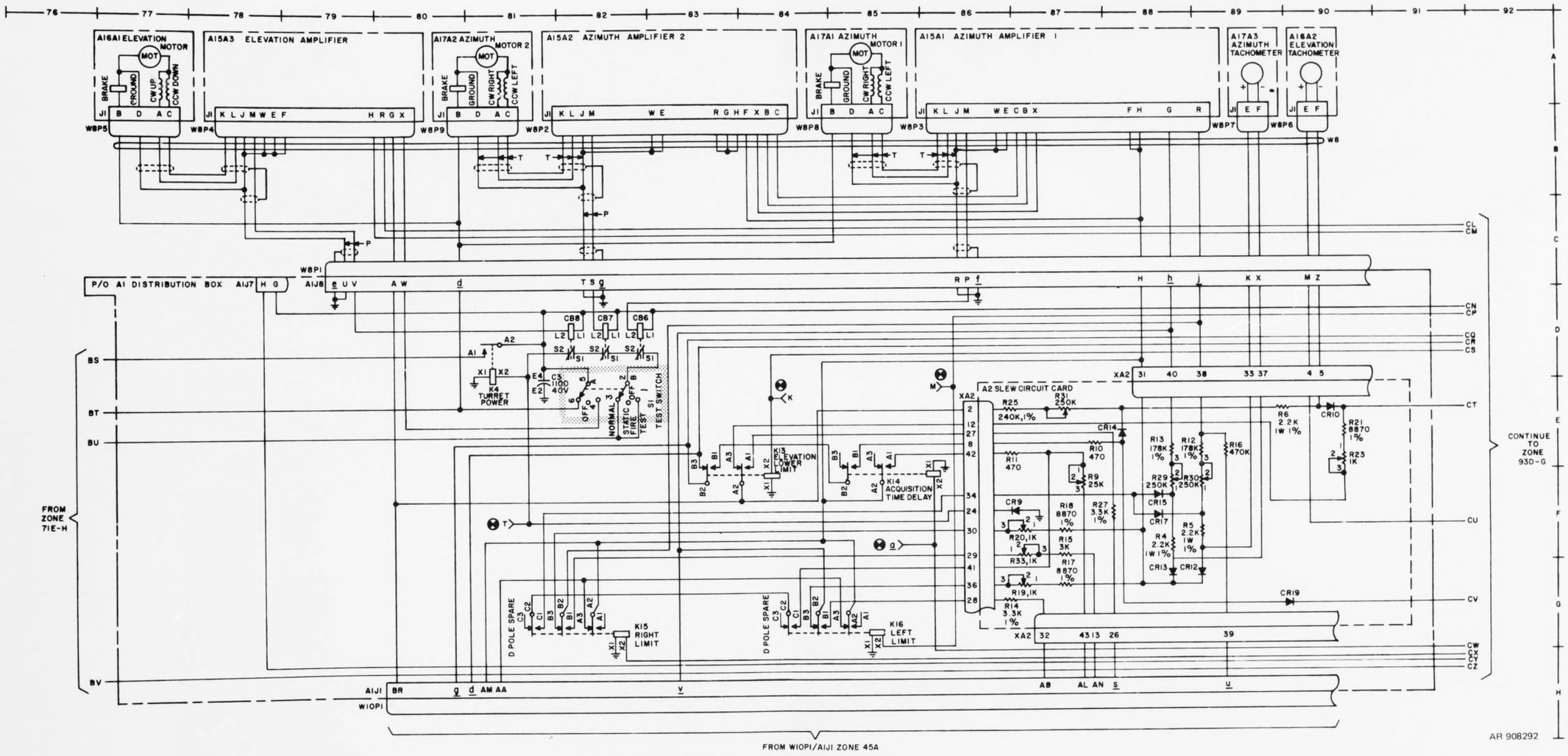


Figure S-38. Detailed interconnection diagram (sheet 15 of 18).

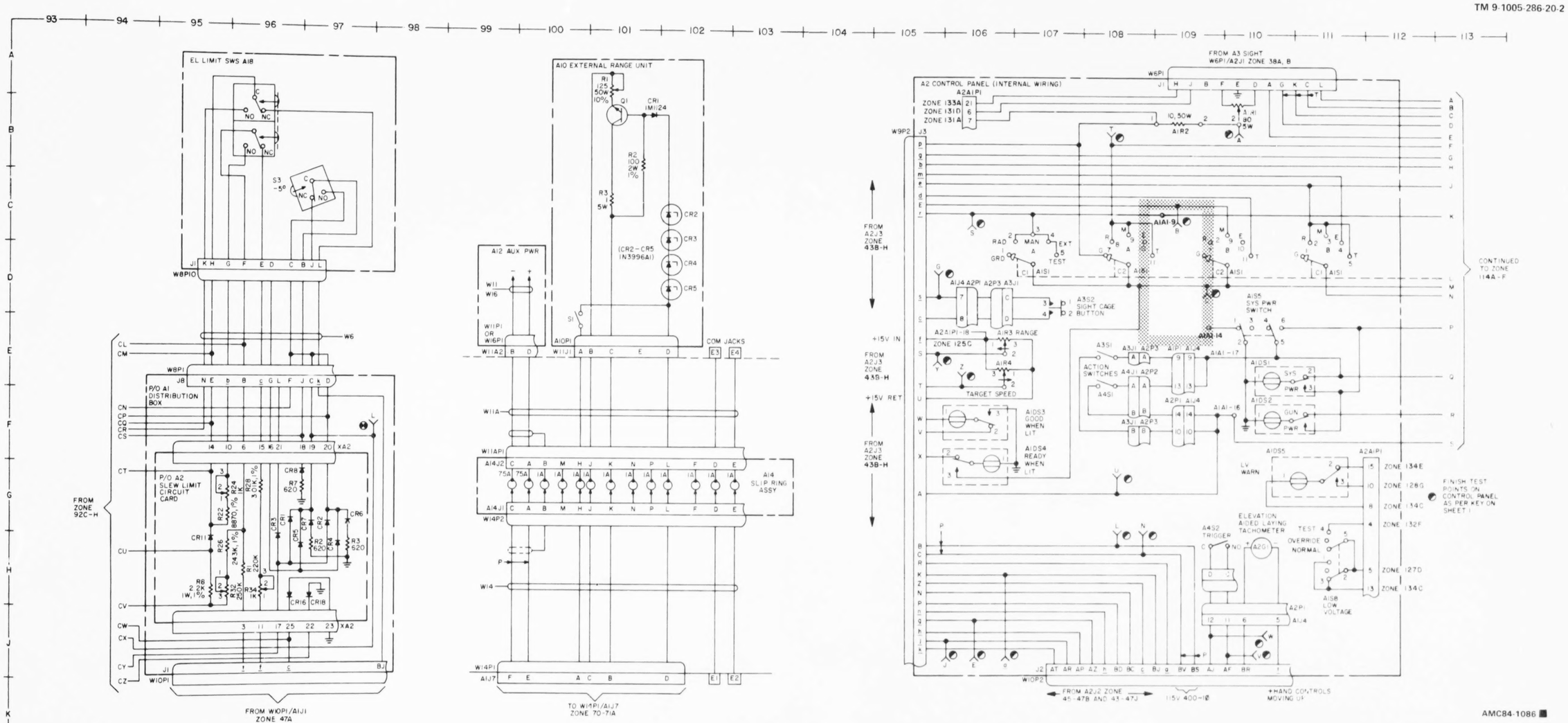


Figure S-38. Detailed interconnection diagram (sheet 16 of 18).

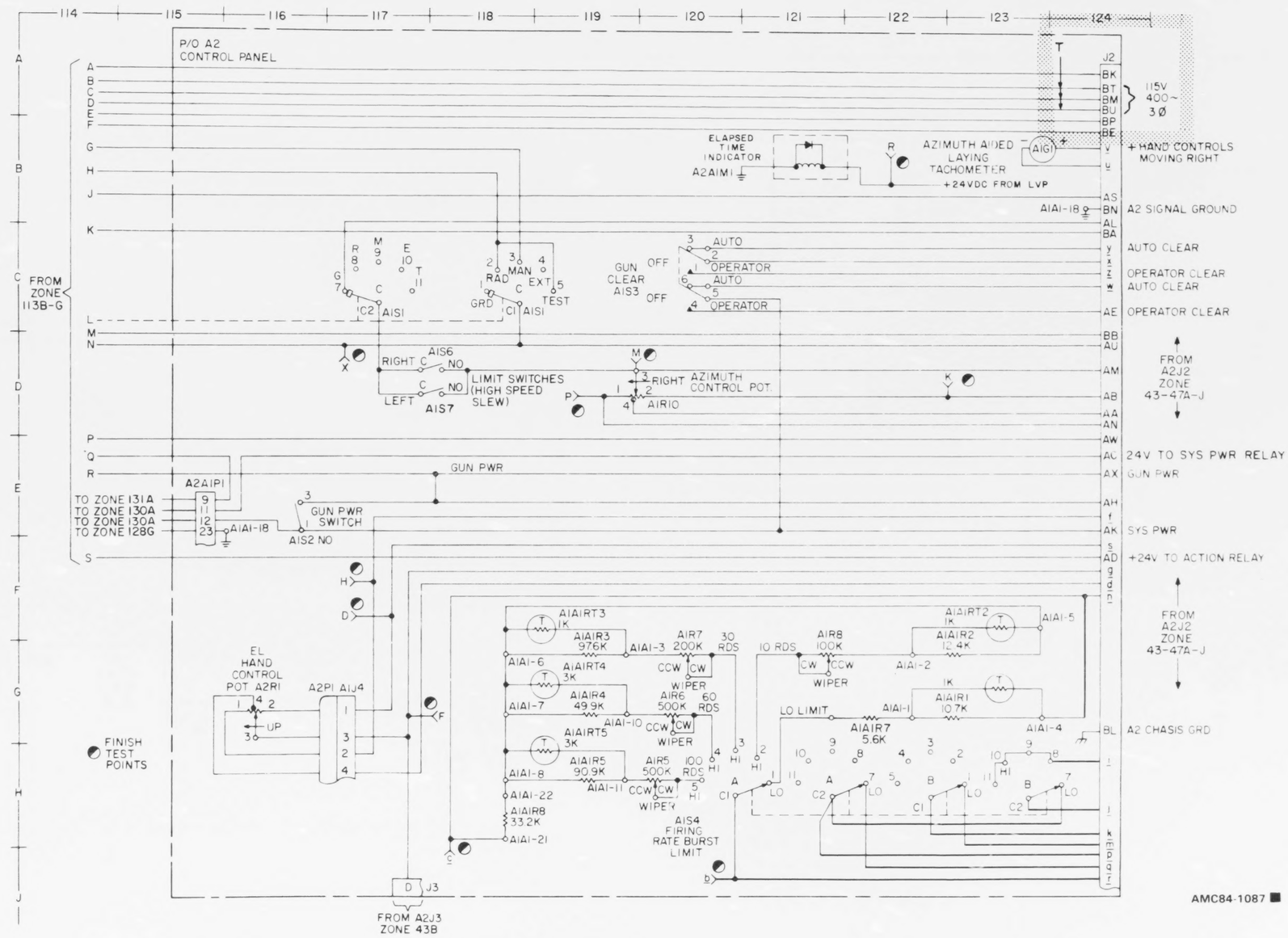


Figure S-38. Detailed interconnection diagram (sheet 17 of 18).

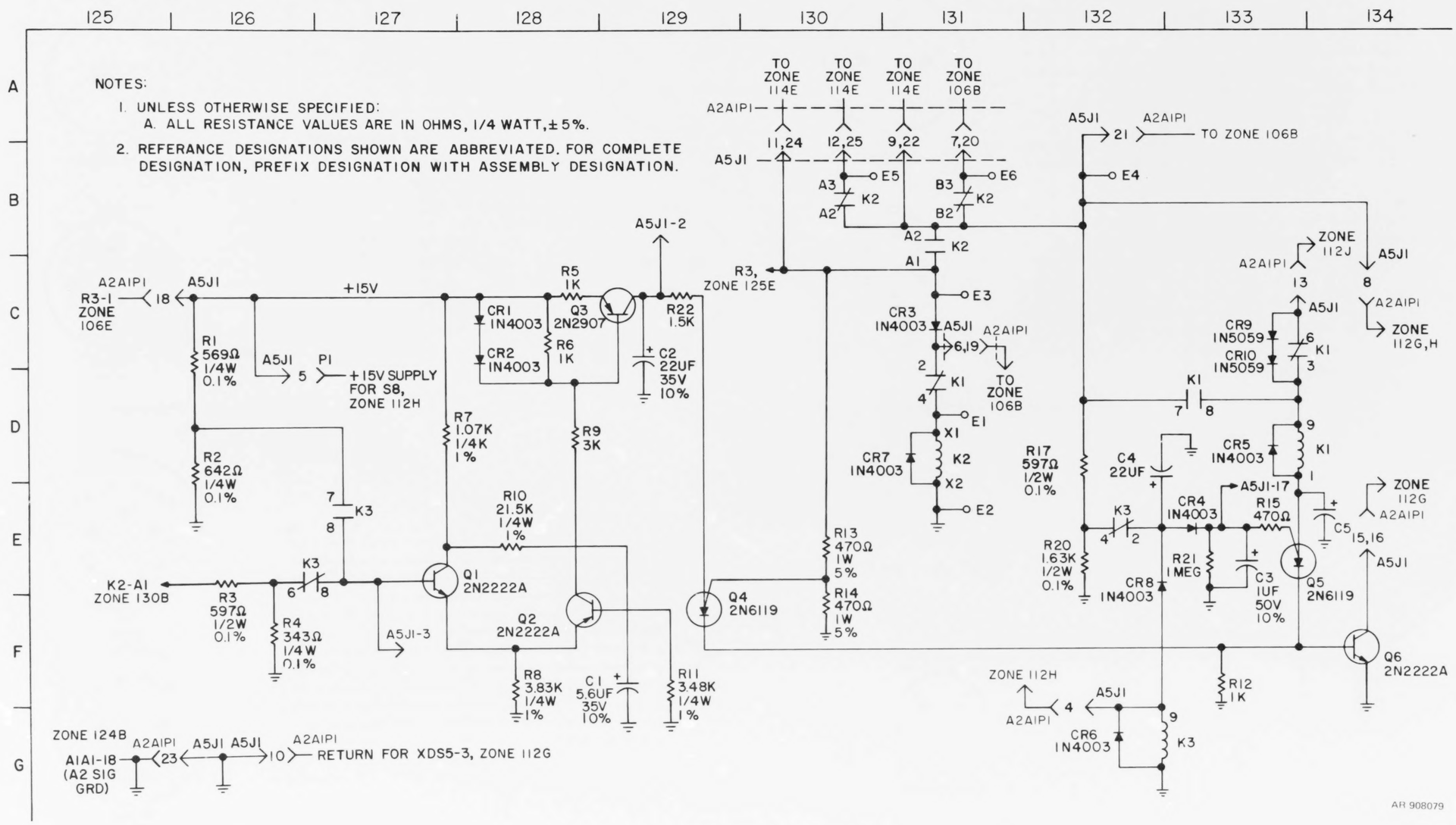


Figure S-38. Detailed interconnection diagram (sheet 18 of 18).

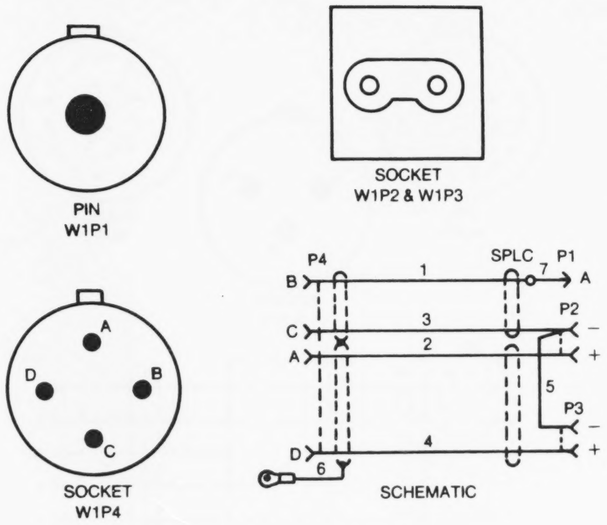


Figure S-39. Cable assembly W1 wiring diagram.

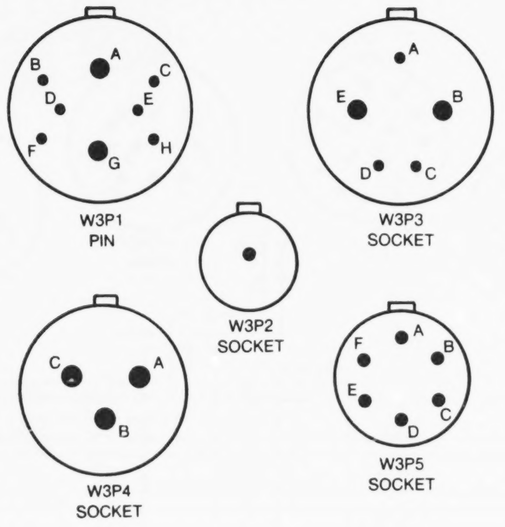


Figure S-41. Cable assembly W3 wiring diagram.

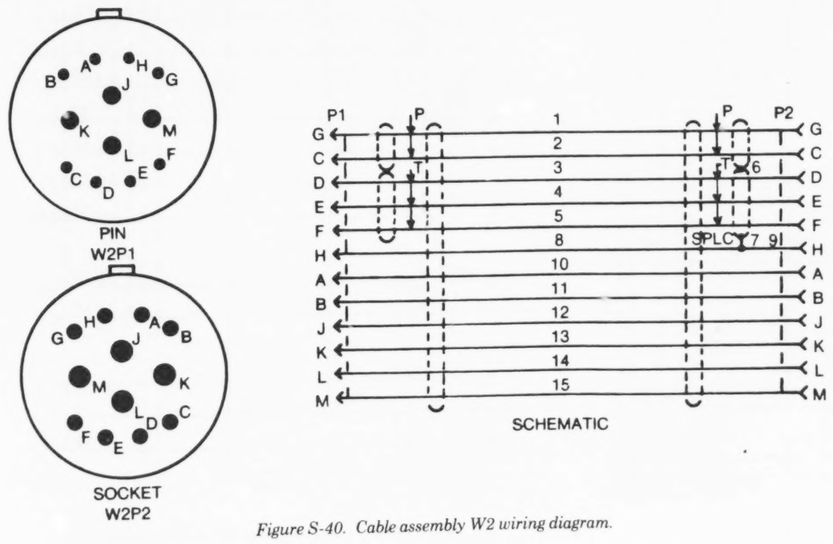


Figure S-40. Cable assembly W2 wiring diagram.

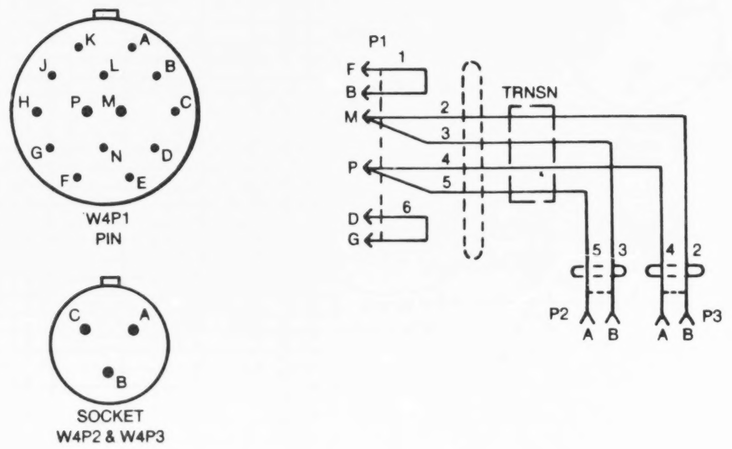


Figure S-42. Cable assembly W4 wiring diagram.

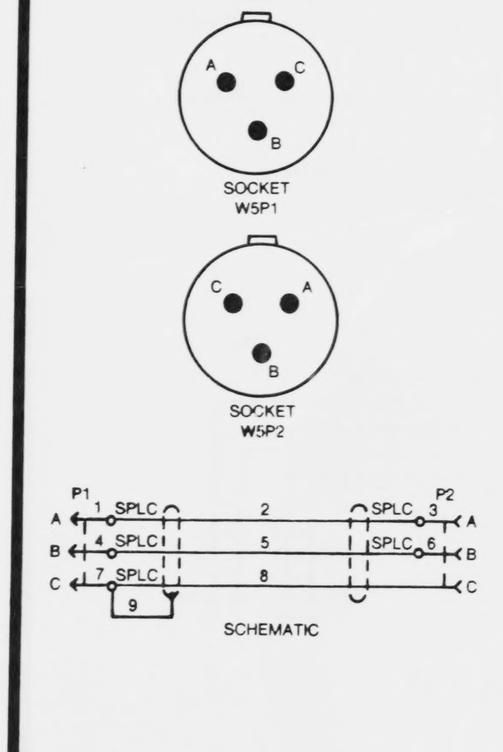


Figure S-43. Cable assembly W5 wiring diagram.

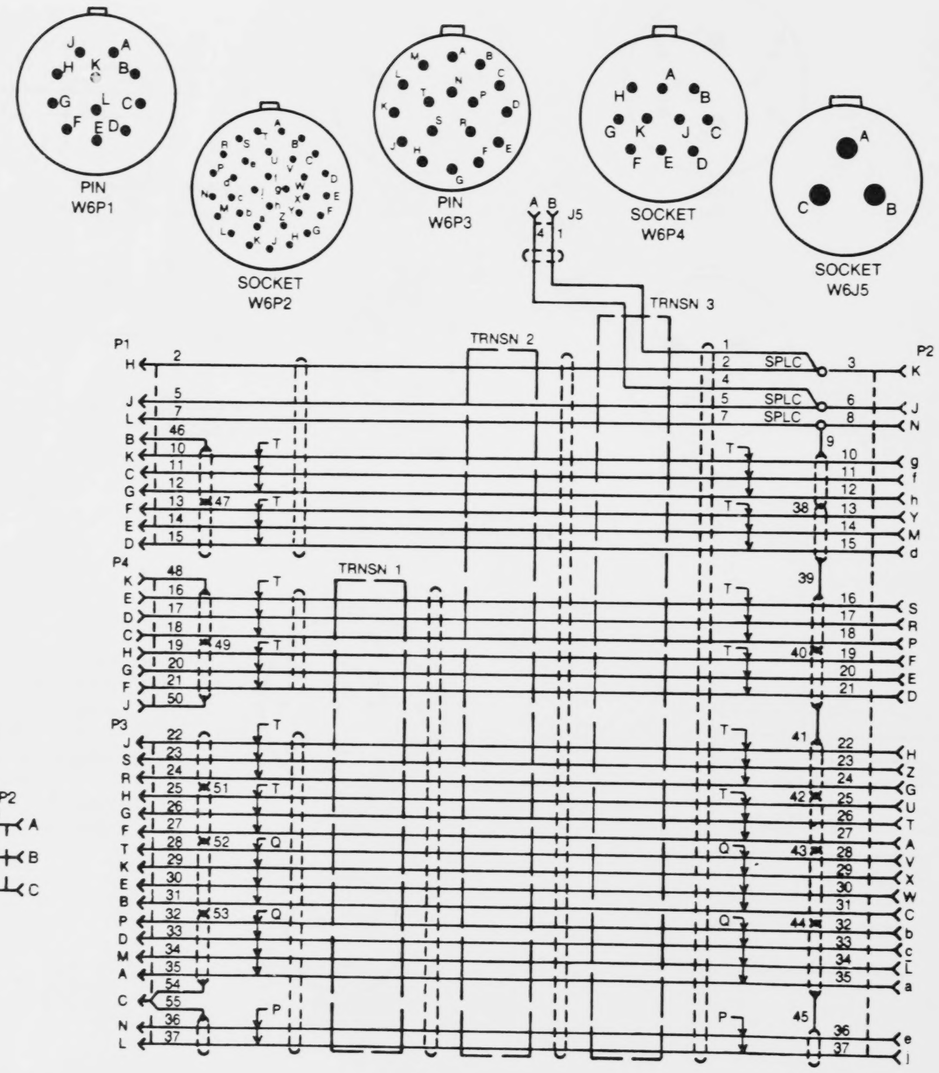


Figure S-44. Cable assembly W6 wiring diagram.

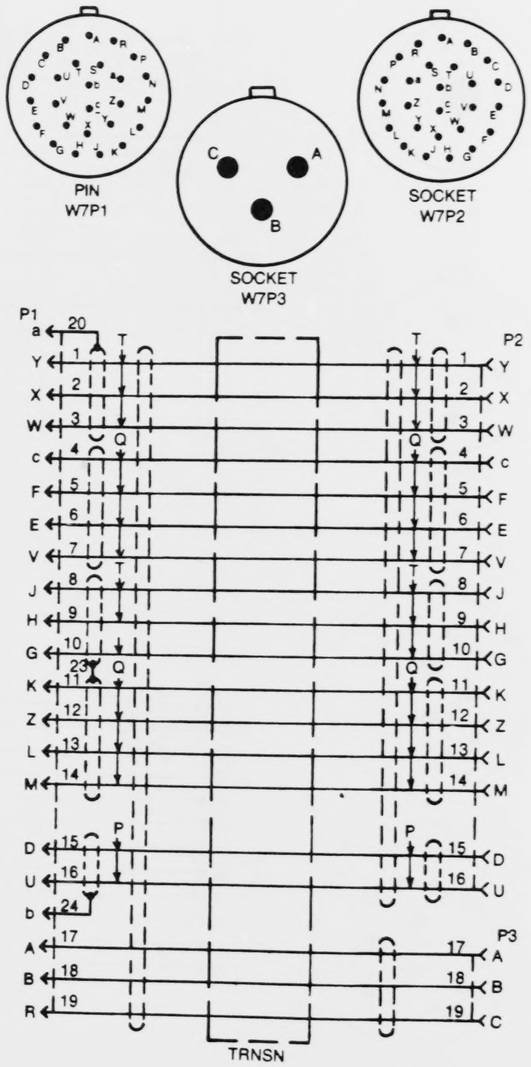


Figure S-45. Cable assembly W7 wiring diagram.

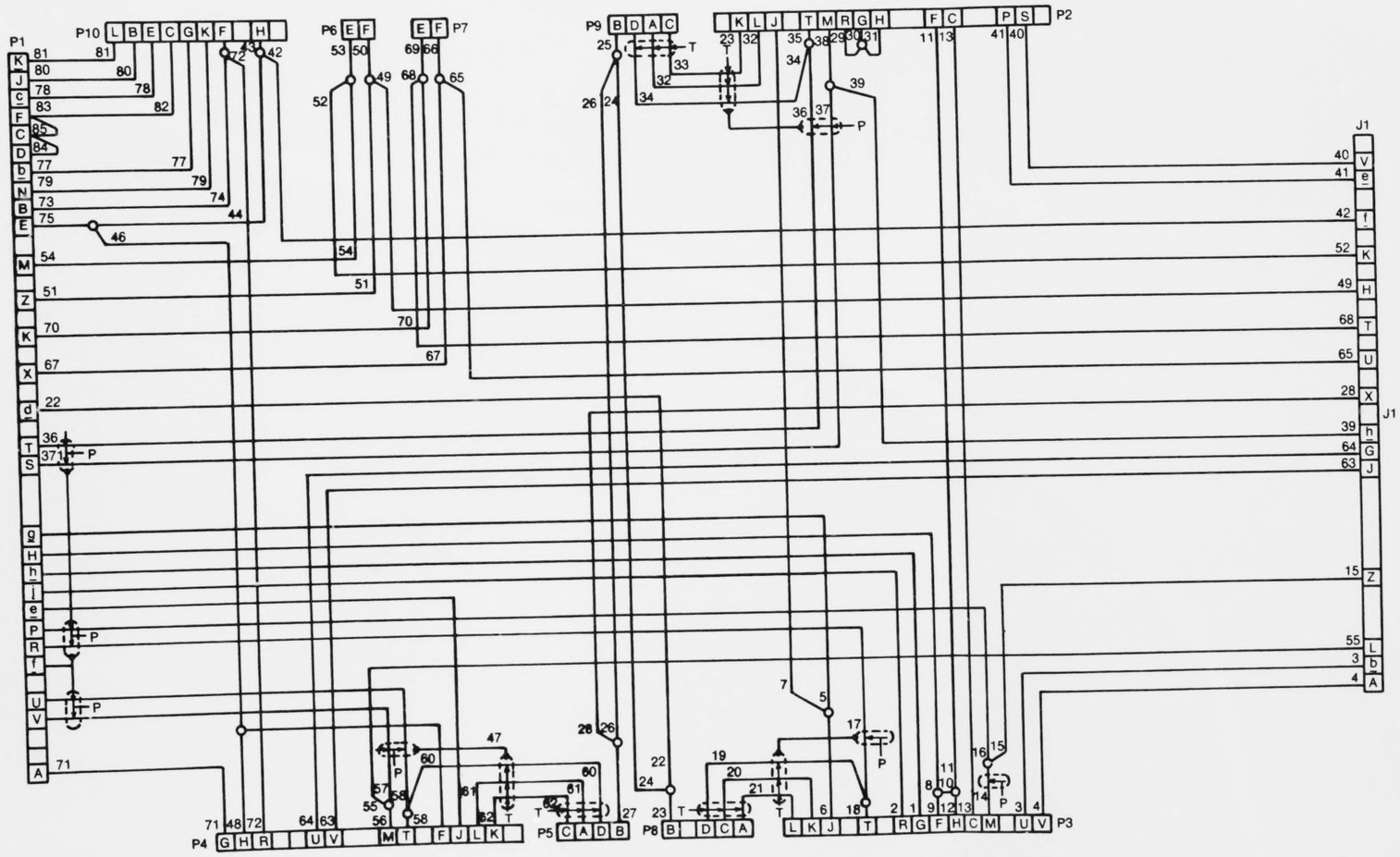
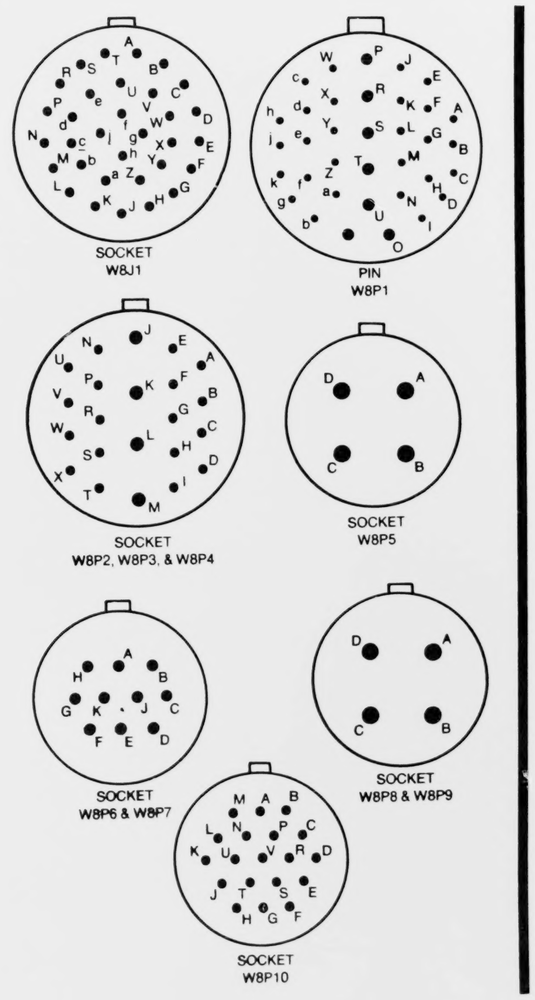


Figure S-46. Cable assembly W8 wiring diagram.



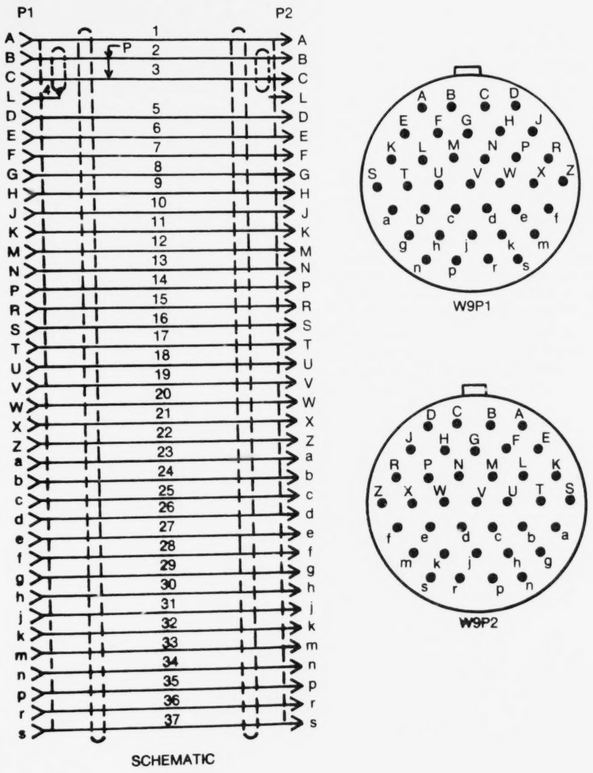


Figure S-47. Cable assembly W9 wiring diagram.

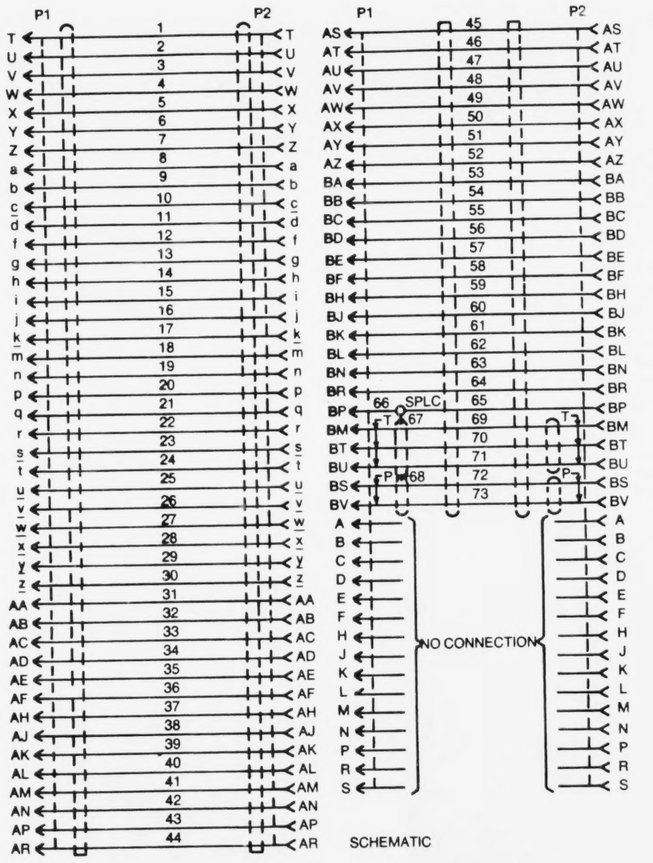


Figure S-48. Cable assembly W10 wiring diagram.

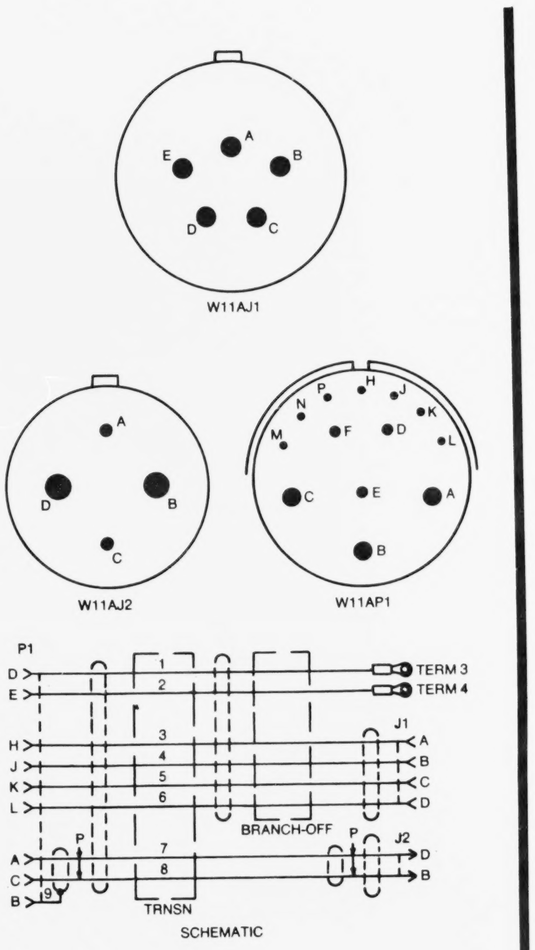


Figure S-49. Cable assembly W11A wiring diagram.

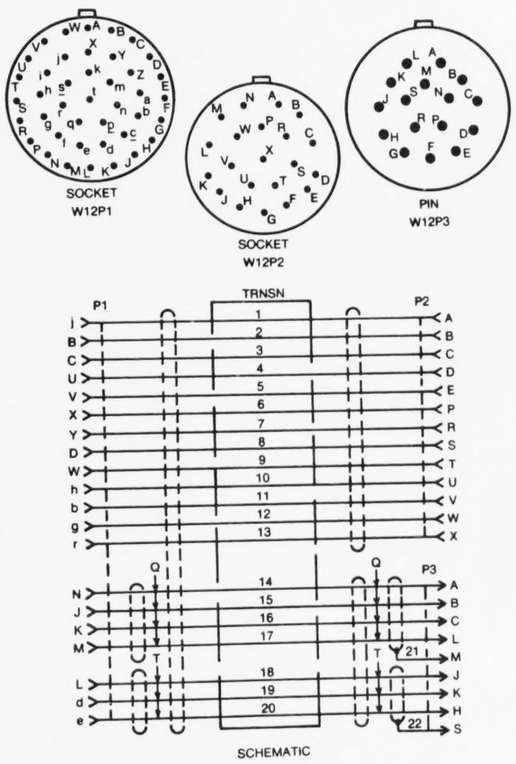


Figure S-50. Cable assembly W12 wiring diagram.

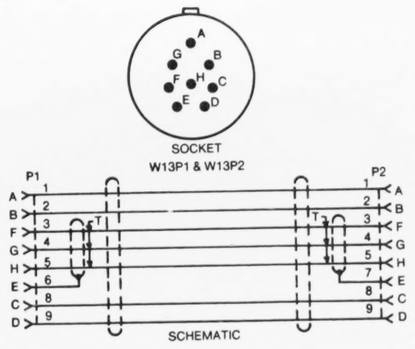


Figure S-51. Cable assembly W13 wiring diagram.

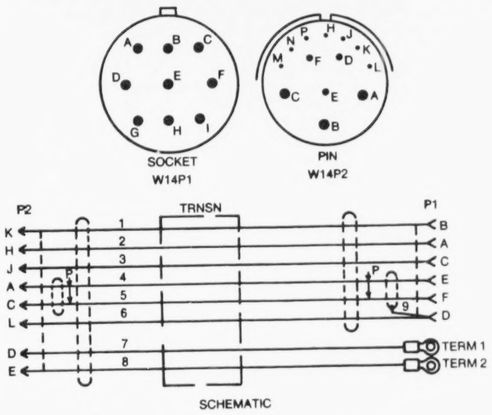


Figure S-52. Cable assembly W14 wiring diagram.

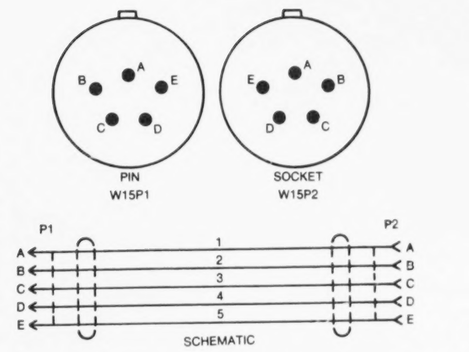


Figure S-53. Cable assembly W15 wiring diagram.

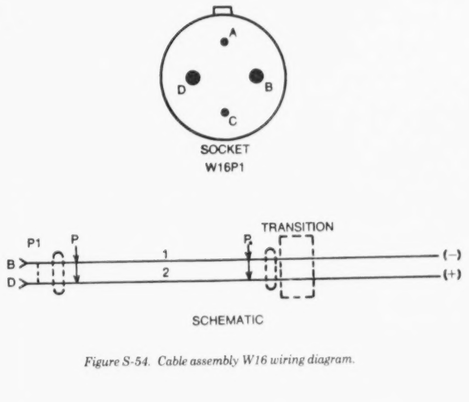


Figure S-54. Cable assembly W16 wiring diagram.

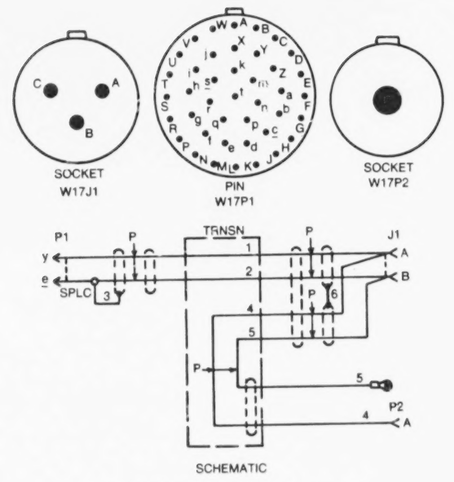


Figure S-55. Cable assembly W17 wiring diagram.

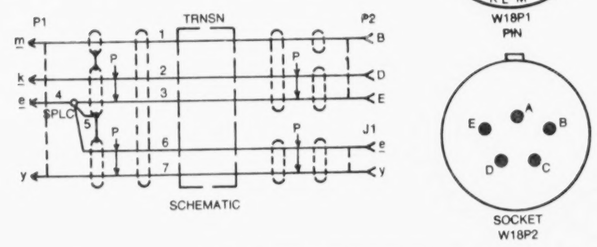


Figure S-56. Cable assembly W18 wiring diagram.

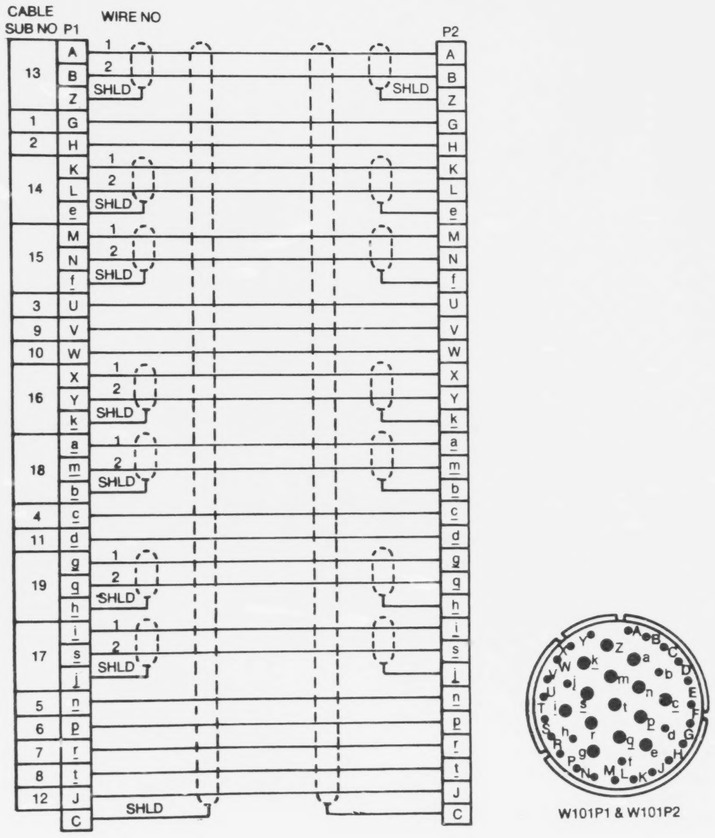


Figure S-57. Cable assembly W101 connectors.

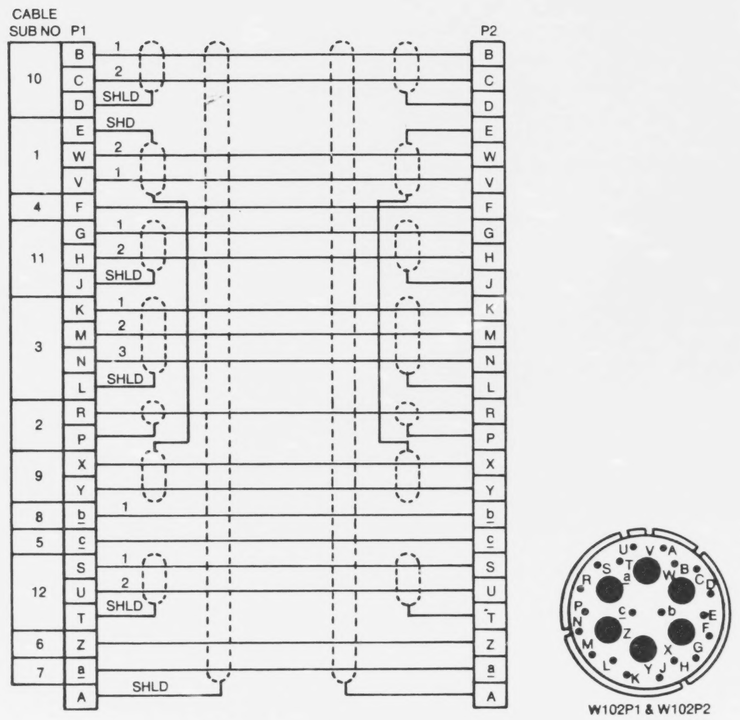


Figure S-58. Cable assembly W102 connectors.

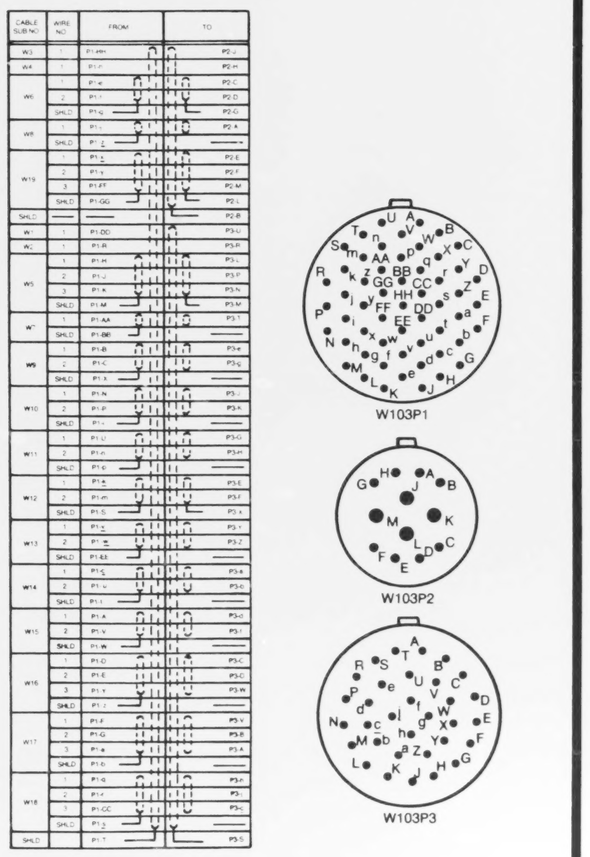
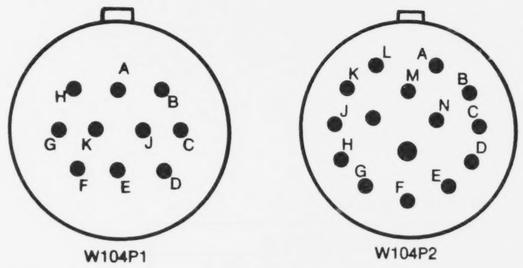


Figure S-59. Cable assembly W103 connectors.



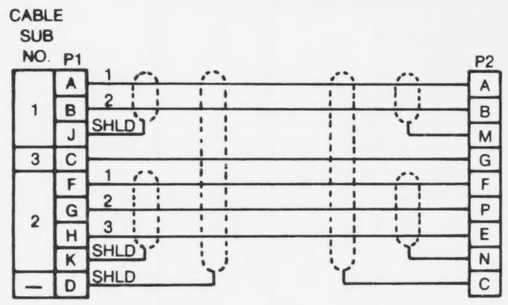
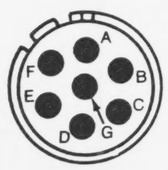
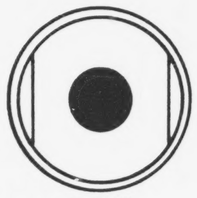


Figure S-60. Cable assembly W104 connectors.



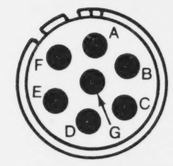
W105P1, W105P2, W105P3, & W105P4



W105P5

CABLE	WIRE NO.	FROM	TO
W1	1	P1-E	P2-E
	2	P1-B	P2-B
	3	P1-C	P2-C
	4	P1-D	P2-D
	SHLD	P1-E	P1-E
W2	1	P1-F	P2-F
	2	P1-G	P2-G
	SHLD	—	P2-A
W3	1	P1-A	P3-E
	SHLD	—	P3-D
W4	1	P4-B	P3-B
W5	1	P4-F	P3-F
W6	1	P4-G	P3-G
	SHLD	P4-E	—
SHLD	—	P4-A	—
—	—	P4-C	—
—	—	P4-D	—
W7	1	P5	P3-A
SHLD	—	—	P3-C

Figure S-61. Cable assembly W105 connectors.



W106P1 & W106P2

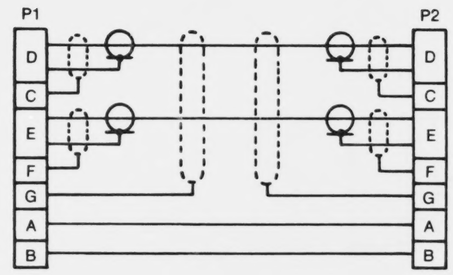
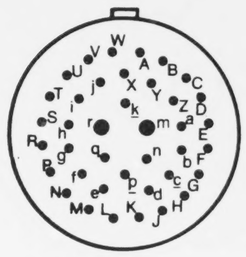


Figure S-62. Cable assembly W106 connectors.



W107P1 & W107P2

CABLE SUB NO.	WIRE NO.	FROM	TO
7	1	P1-G	P2-G
	2	P1-H	P2-H
	3	P1-c	P2-c
	SHLD	P1-b	P2-b
9	1	P1-S	P2-S
	2	P1-g	P2-g
	3	P1-h	P2-h
	4	P1-f	P2-f
	SHLD	P1-i	P2-i
3	1	P1-W	P2-W
	2	P1-X	P2-X
	SHLD	P1-j	P2-j
2		P1-Y	P2-Y
4		P1-a	P2-a
6		P1-n	P2-n
5	1	P1-d	P2-d
	2	P1-e	P2-e
	SHLD	P1-p	P2-p
1	1	P1-m	P2-m
	2	P1-r	P2-r
	SHLD	P1-k	P2-k
8		P1-q	P2-q
—	SHLD	P1-A	P2-A

Figure S-63. Cable assembly W107 connectors.

CABLE SUB NO.	WIRE NO.	FROM	TO
1	1	P1-D	P2-D
	2	P1-E	P2-E
	3	P1-F	P2-F
	SHLD	P1-Z	P2-Z
9	1	P1-G	P2-G
	2	P1-H	P2-H
	3	P1-c	P2-c
	SHLD	P1-b	P2-b
11	1	P1-M	P2-M
	2	P1-N	P2-N
	3	P1-P	P2-P
	SHLD	P1-R	P2-R
2	1	P1-S	P2-S
	2	P1-f	P2-f
	3	P1-g	P2-g
	4	P1-h	P2-h
	SHLD	P1-i	P2-i
3	1	P1-W	P1-W
	2	P1-X	P2-X
	SHLD	P1-j	P2-j
4		P1-Y	P2-Y
6		P1-a	P2-a
5	1	P1-d	P2-d
	2	P1-e	P2-e
	SHLD	P1-p	P2-p
8		P1-q	P2-q
10		P1-n	P2-n
7	1	P1-r	P2-r
	2	P1-m	P2-m
	SHLD	P1-k	P2-k
—		P1-A	P2-A

W108P1 & W108P2

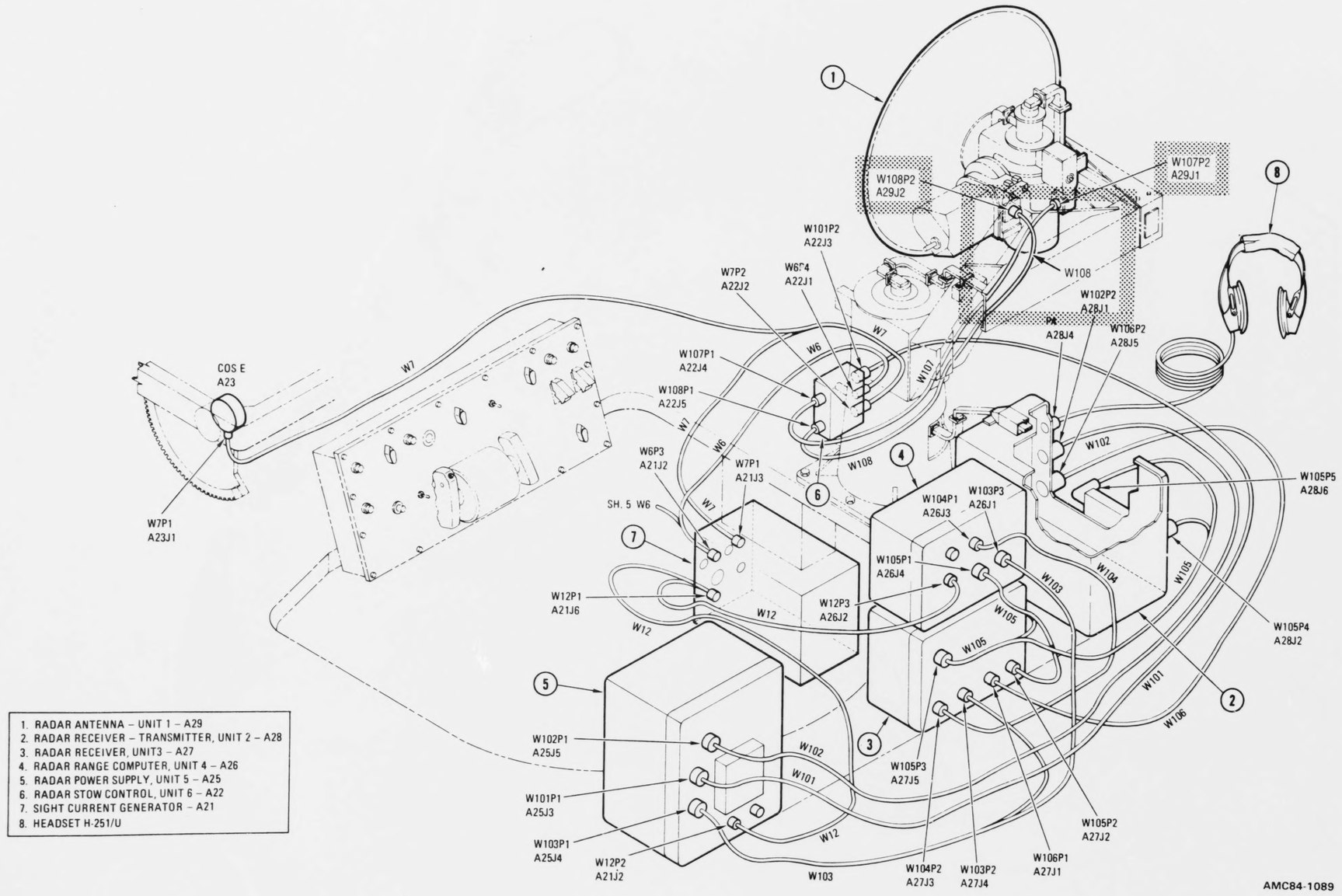
Figure S-64. Cable assembly W108 connectors.

M167A1 CABLES

CABLE	ROUTING SHOWN ON			
	SH. 2	SH. 3	SH. 4	SH. 5
W1		X		
W2				X
W3		X		
W4		X		
W5		X		
W6	X			X
W7	X			
W8		X	X	X
W9				X
W10				X
W11			X	
W11A			X	
W12	X			
W13				X
W14			X	
W15			X	
W16			X	
W17			X	
W18			X	
W101	X			
W102	X			
W103	X			
W104	X			
W105	X			
W106	X			
W107	X			
W108	X			

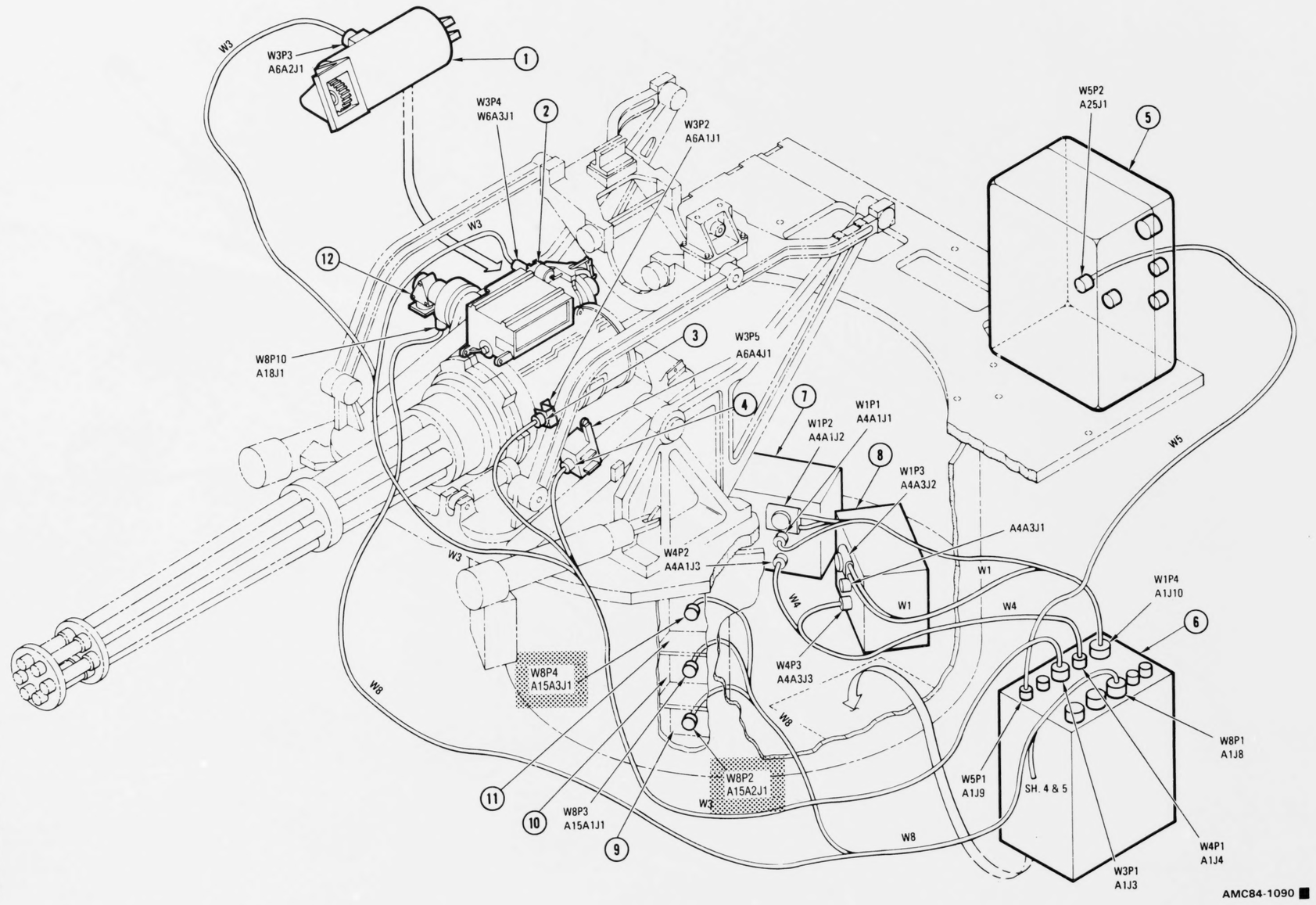
AR 908307

Figure S-65. Cable routing (Sheet 1 of 5).



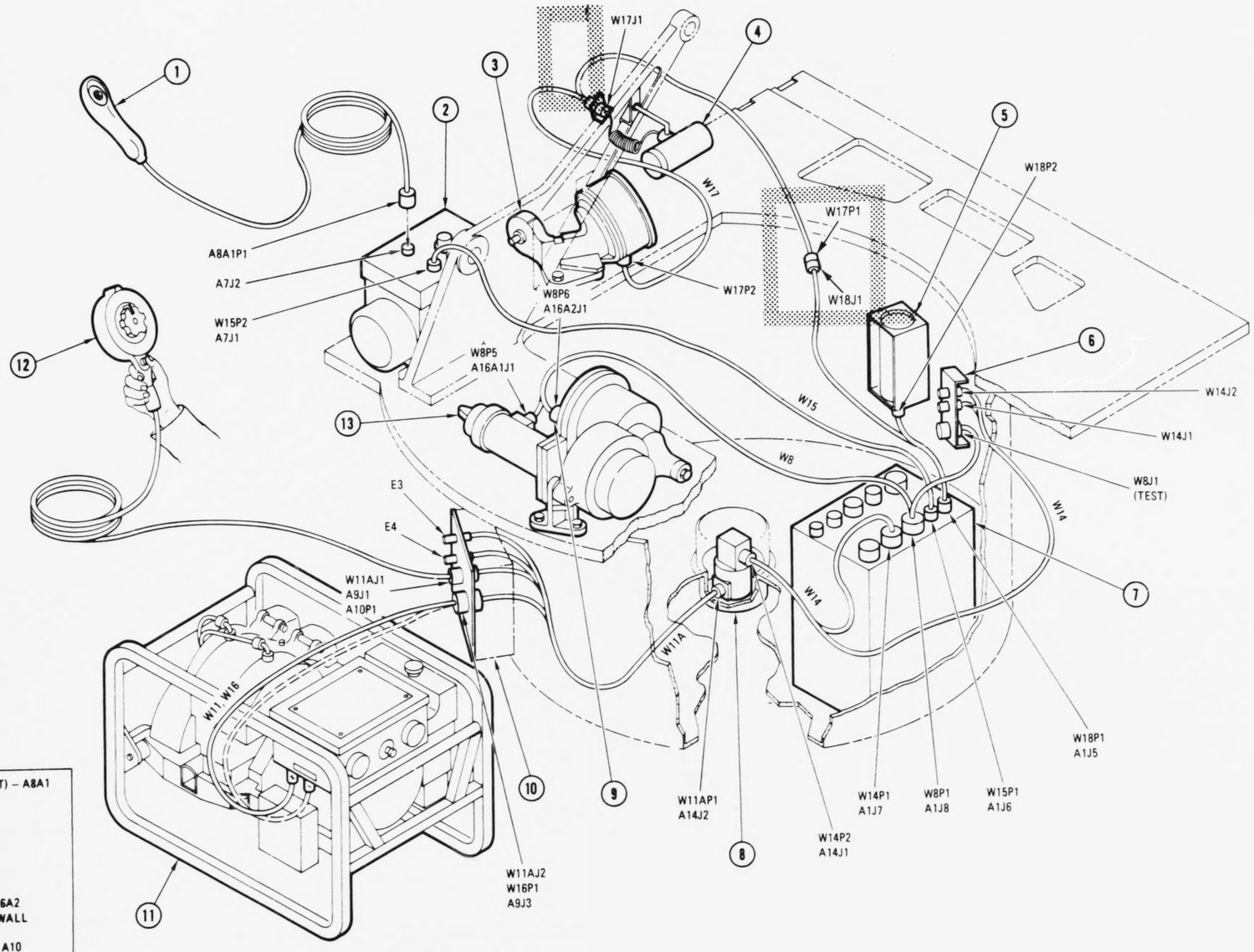
1. RADAR ANTENNA – UNIT 1 – A29
2. RADAR RECEIVER – TRANSMITTER, UNIT 2 – A28
3. RADAR RECEIVER, UNIT3 – A27
4. RADAR RANGE COMPUTER, UNIT 4 – A26
5. RADAR POWER SUPPLY, UNIT 5 – A25
6. RADAR STOW CONTROL, UNIT 6 – A22
7. SIGHT CURRENT GENERATOR – A21
8. HEADSET H-251/U

Figure S-65. Cable routing (sheet 2 of 5).



1. GUN MOTOR AND BRAKE – A6A2
2. DECLUTCHING FEEDER – A6A3
3. FIRING VOLTS – A6A1
4. CLEAR AND BRAKE RELEASE – A6A4
5. RADAR POWER SUPPLY, UNIT 5 – A25
6. DISTRIBUTION BOX – A1
7. GUN BATTERY – A4A1
8. SYSTEM BATTERY – A4A3
9. ELEVATION AMP – A15A3
10. AZ NO. 1 AMP – A15A1
11. AZ NO. 2 AMP – A15A2
12. EL LIMIT SWITCH – A18

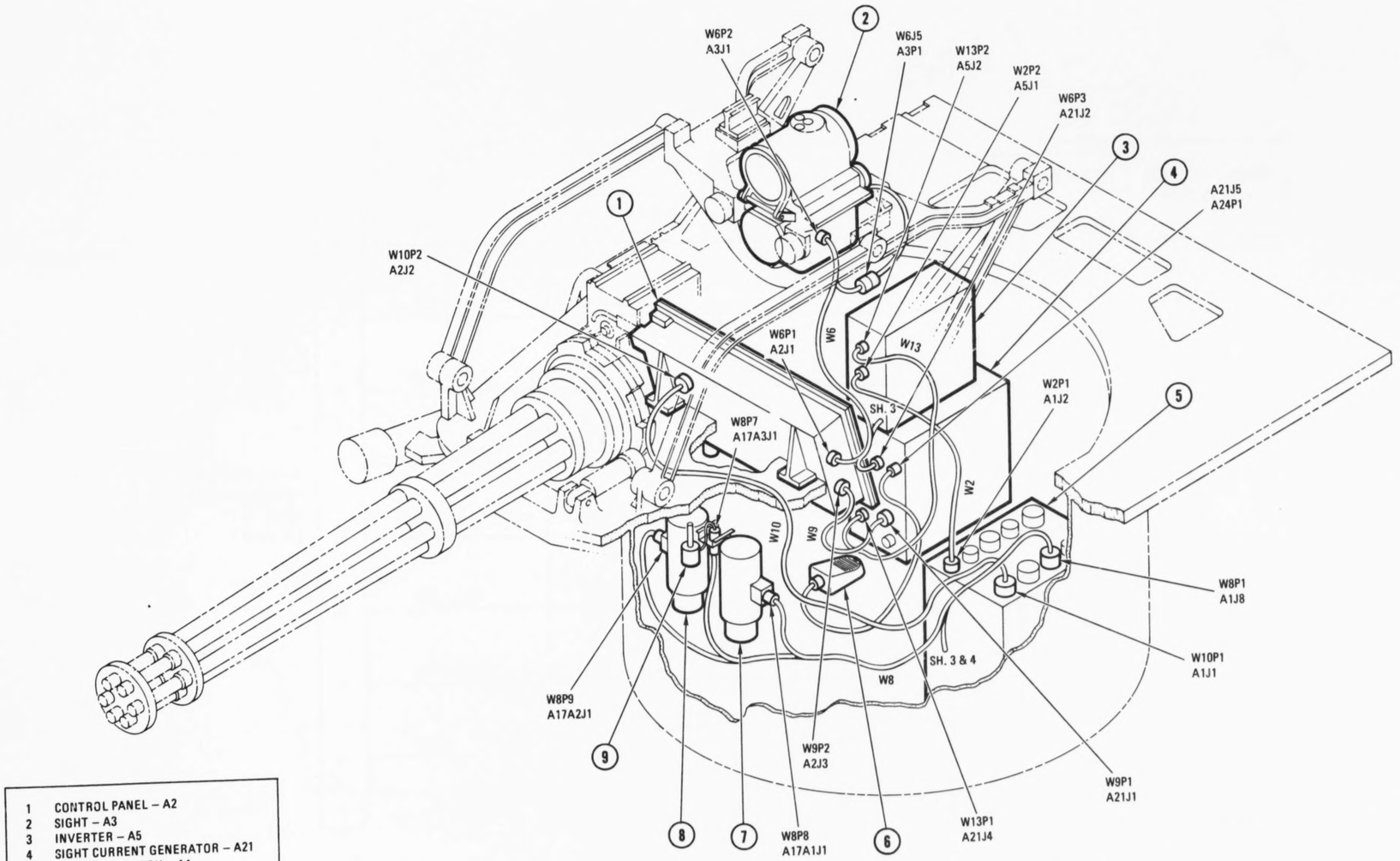
Figure S-65. Cable routing (sheet 3 of 5).



1 SWITCH ASSEMBLY SAFE (SHORT) – A8A1
2 FIRING INTERRUPTER – A7
3 AZIMUTH INDICATOR
4 LIGHT ASSEMBLY
5 ROUNDS COUNTER
6 COMM BRACKET
7 DISTRIBUTION BOX – A1
8 SLIP RING – A14
9 ELEVATION TACHOMETER – A16A2
10 EXTERNAL PHONE CARRIAGE WALL
11 AUXILIARY POWER UNIT – A12
12 EXTERNAL RANGE CONTROL – A10
13 ELEVATION MOTOR – A16A1

AMC84-1215 ■

Figure S-65. Cable routing (sheet 4 of 5).



1 CONTROL PANEL – A2
2 SIGHT – A3
3 INVERTER – A5
4 SIGHT CURRENT GENERATOR – A21
5 DISTRIBUTION BOX – A1
6 FOOT SWITCH – A24
7 AZ MOTOR NO. 1 – A17A1
8 AZ MOTOR NO. 2 – A17A2
9 AZ TACHOMETER – A17A3

AR 908311

Figure S-65. Cable routing (sheet 5 of 5).

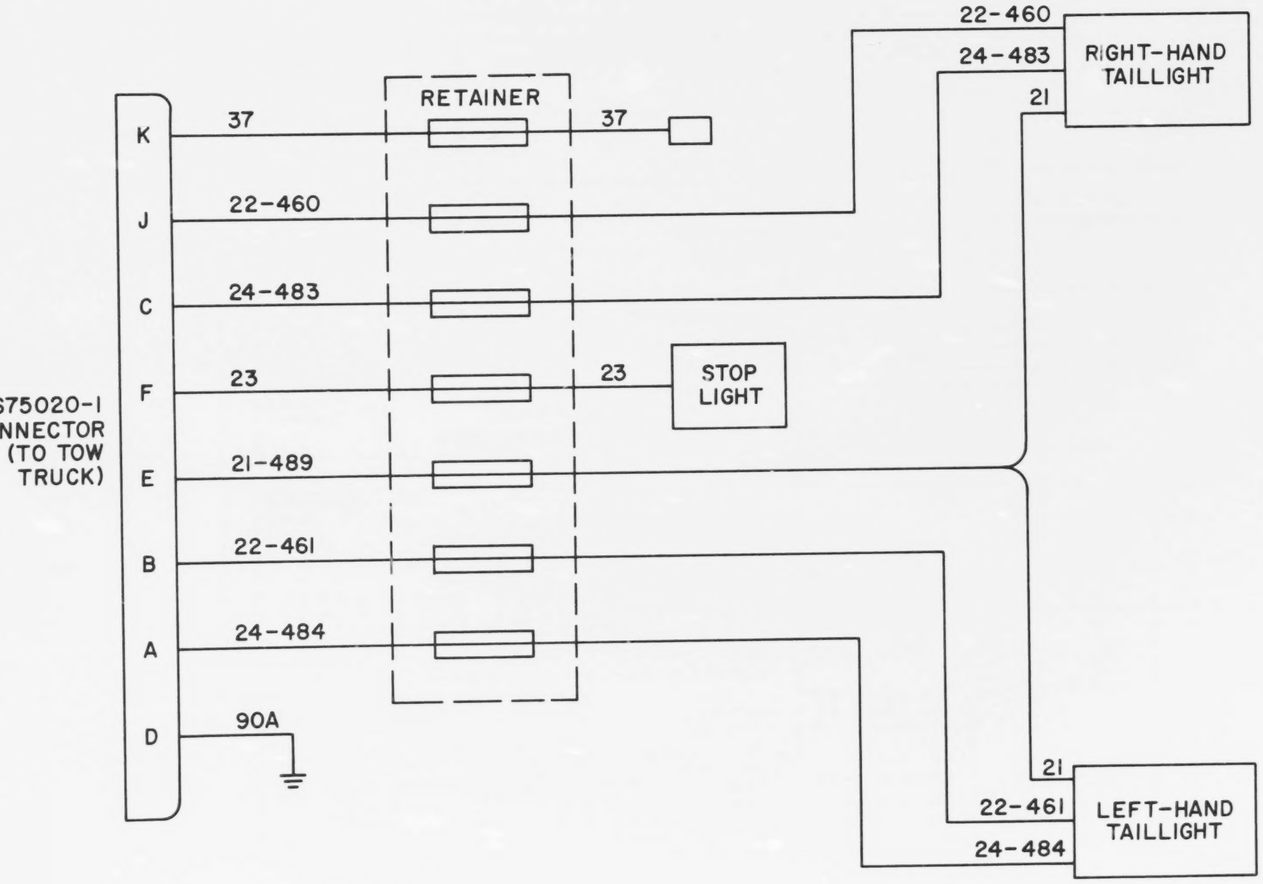
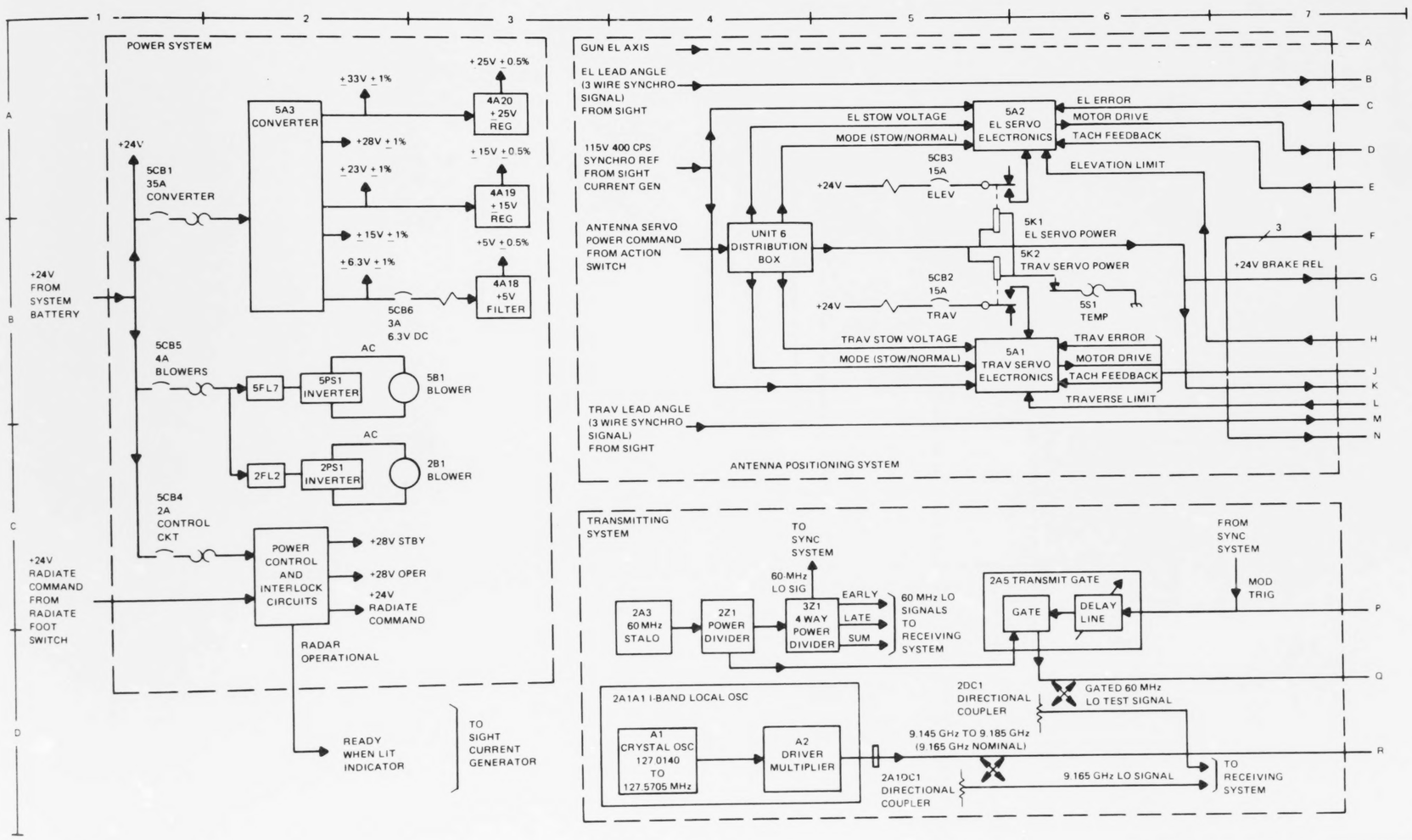


Figure S-66. Taillight/stoplight schematic diagram.



REFERENCE DESIGNATION	ZONE
2B1	C-2
2DC1	D-6
2A1DC1	D-5
5B1	B-2
5CB1	A-1
5CB2	B-5
5CB6	A-5
5CB4	C-1
5CB5	B-1
5CB6	B-2
5K1	A-5
5K2	B-5
5S1	B-6

AMC84-1091 ■

Figure S-67. Radar set AN/VPS-2 simplified functional schematic (sheet 1 of 4).

REFERENCE DESIGNATION	ZONE
1A2S1	B-9
1A3S1	B-10
2DS1	C-11
2DS2	C-11
2S1	D-11
2A1AT1	D-10
2A1AT2	D-13
2A1AT3	D-8
2A1AT5	D-9
2A1M1	D-11

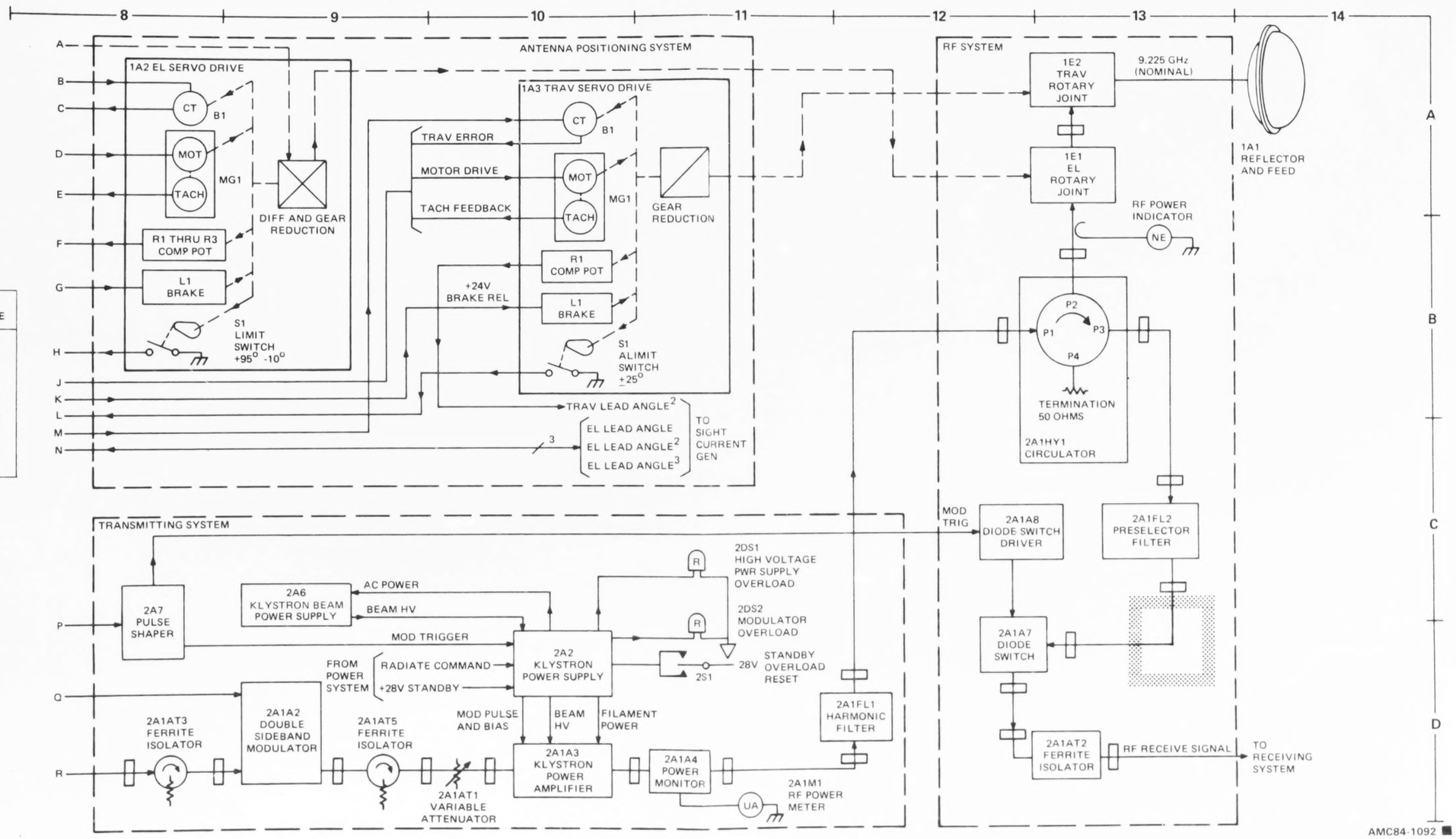


Figure S-67. Radar set AN/VPS-2 simplified functional schematic (sheet 2 of 4).

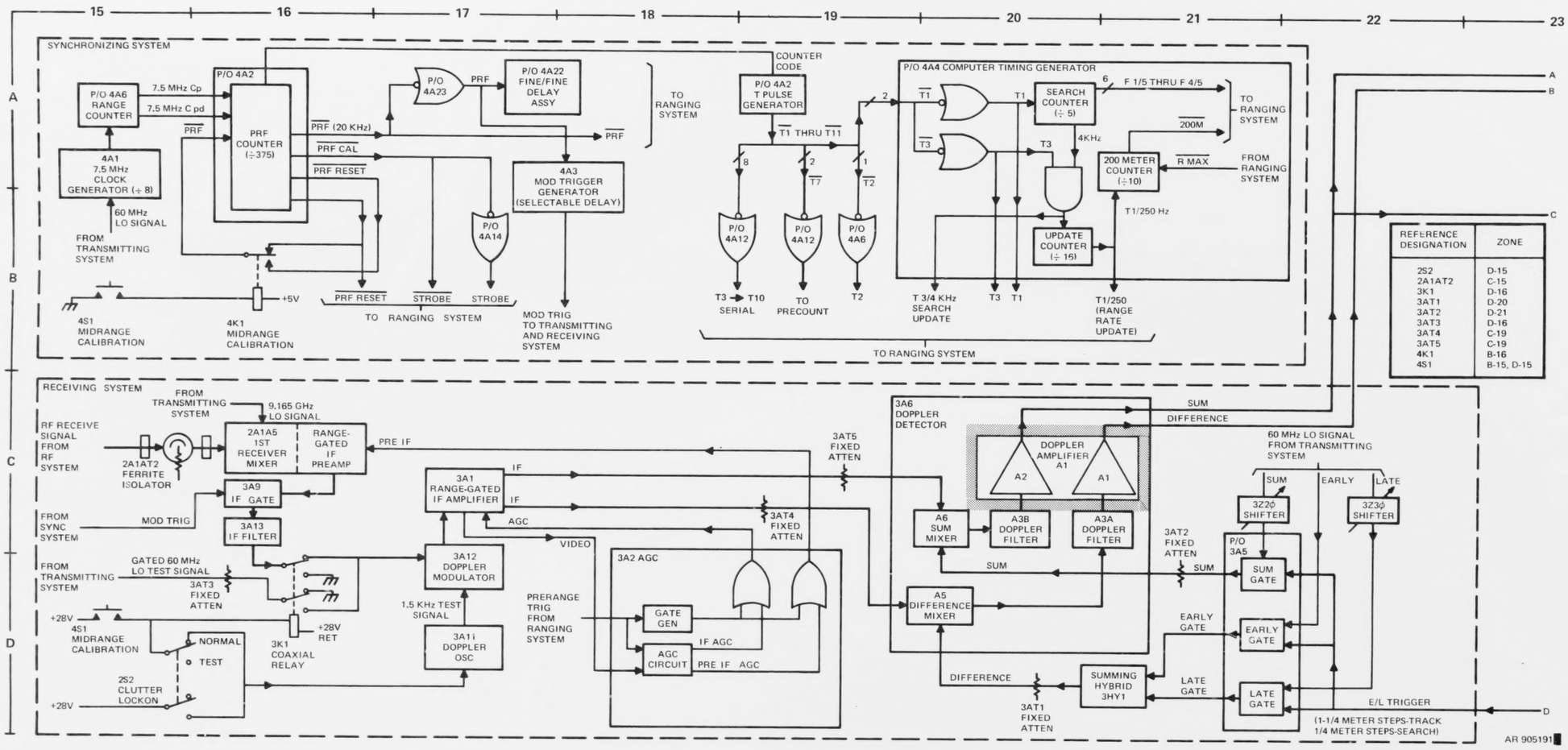
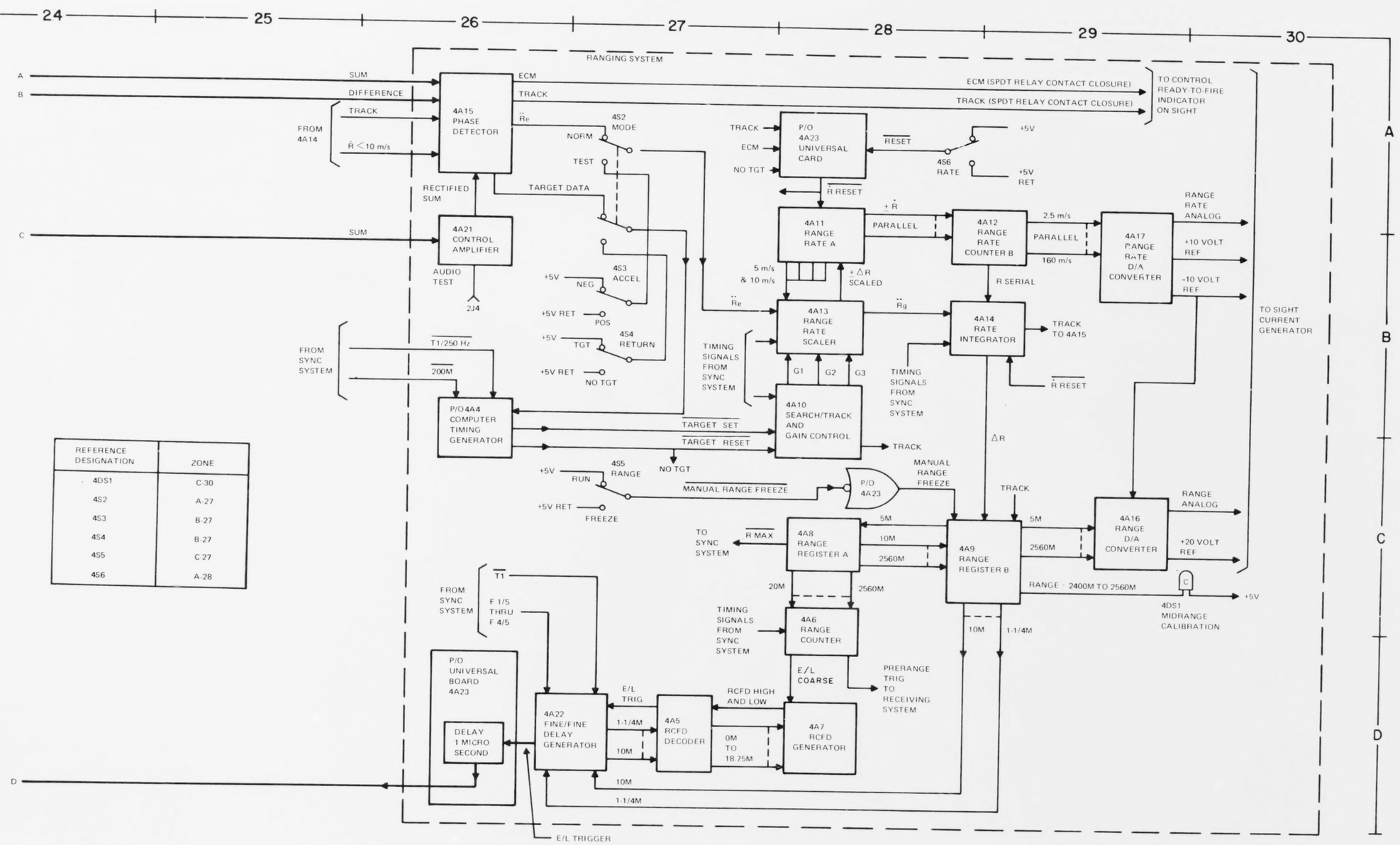


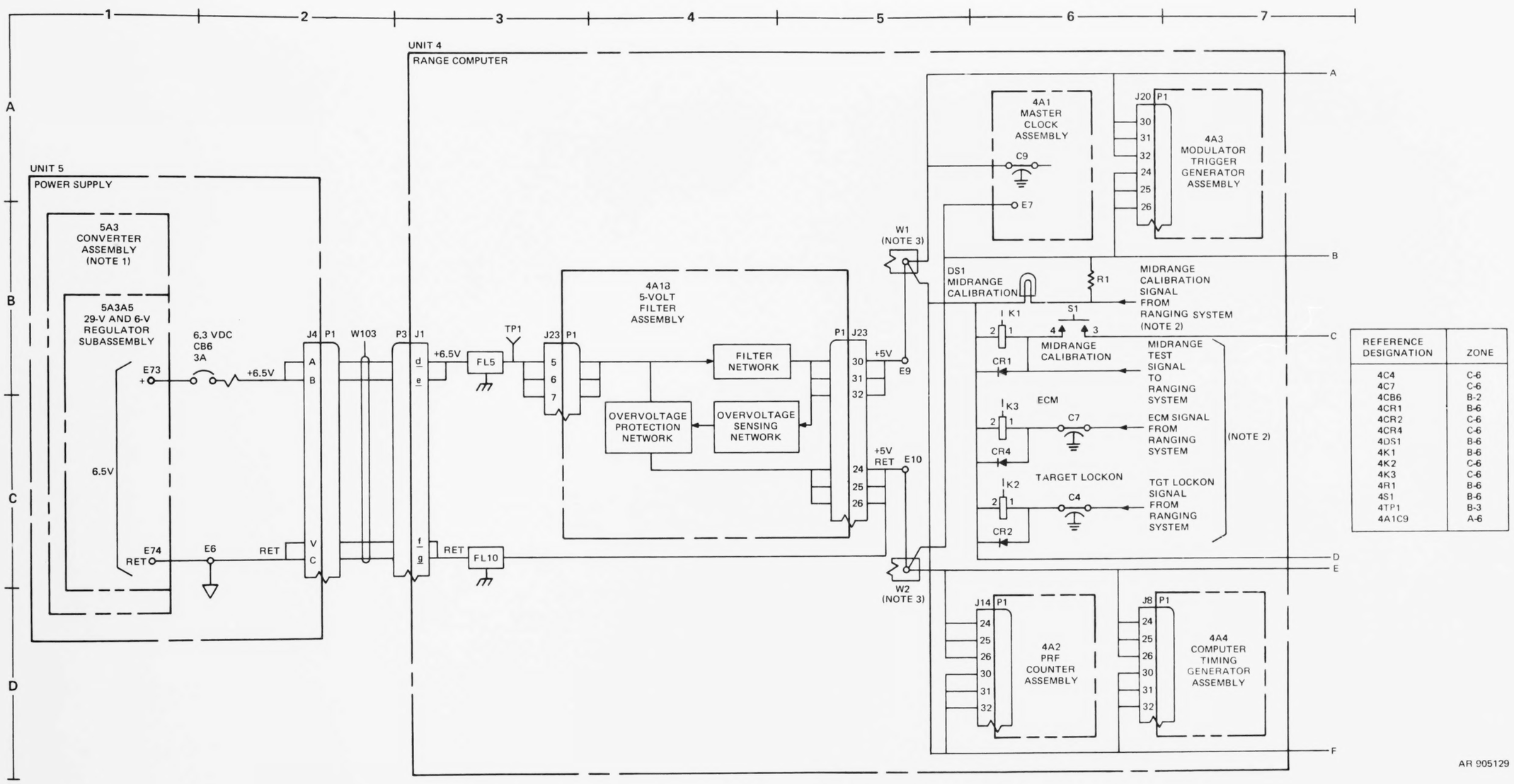
Figure S-67. Radar set AN/VPS-2 simplified functional schematic (sheet 3 of 4).



REFERENCE DESIGNATION	ZONE
4DS1	C-30
4S2	A-27
4S3	B-27
4S4	B-27
4S5	C-27
4S6	A-28

AR 905128

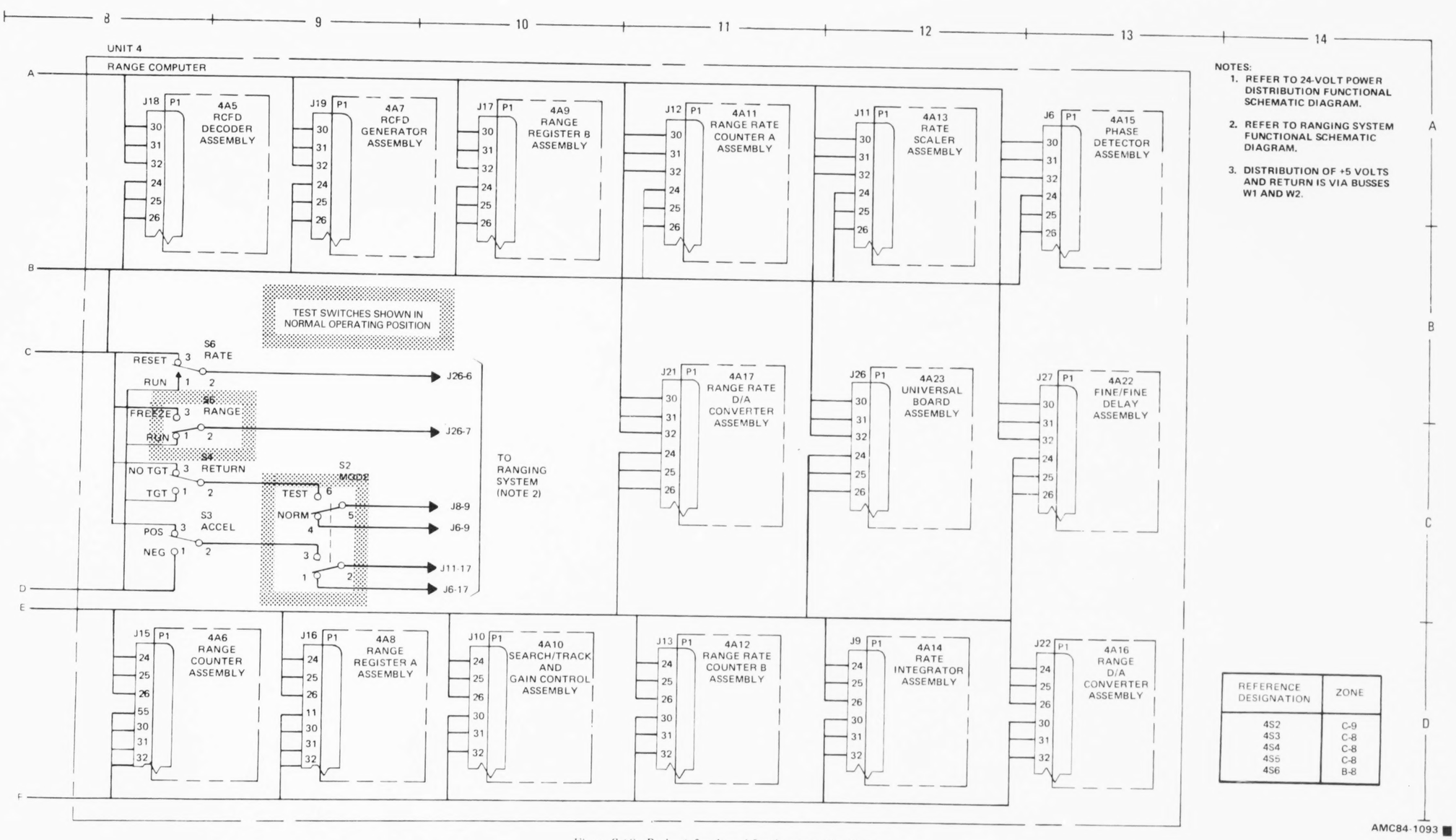
Figure S-67. Radar set AN/VPS-2 simplified functional schematic (sheet 4 of 4).



REFERENCE DESIGNATION	ZONE
4C4	C-6
4C7	C-6
4CB6	B-2
4CR1	B-6
4CR2	C-6
4CR4	C-6
4DS1	B-6
4K1	B-6
4K2	C-6
4K3	C-6
4R1	B-6
4S1	B-6
4TP1	B-3
4A1C9	A-6

AR 905129

Figure S-68. Radar 6.5-volt and 5-volt power distribution functional schematic diagram (sheet 1 of 2).

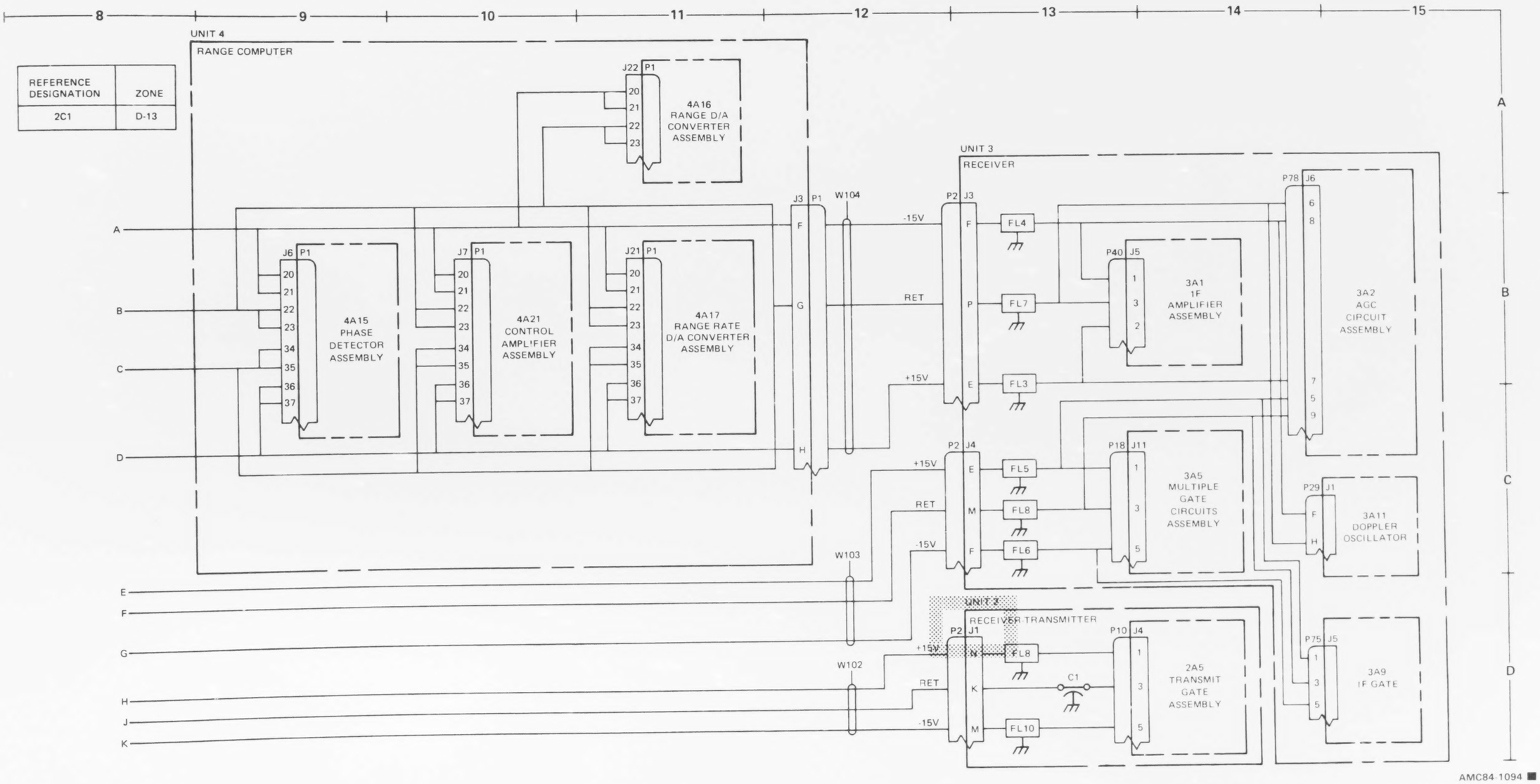


NOTES:
1. REFER TO 24-VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.
2. REFER TO RANGING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
3. DISTRIBUTION OF +5 VOLTS AND RETURN IS VIA BUSSES W1 AND W2.

REFERENCE DESIGNATION	ZONE
4S2	C-9
4S3	C-8
4S4	C-8
4S5	C-8
4S6	B-8

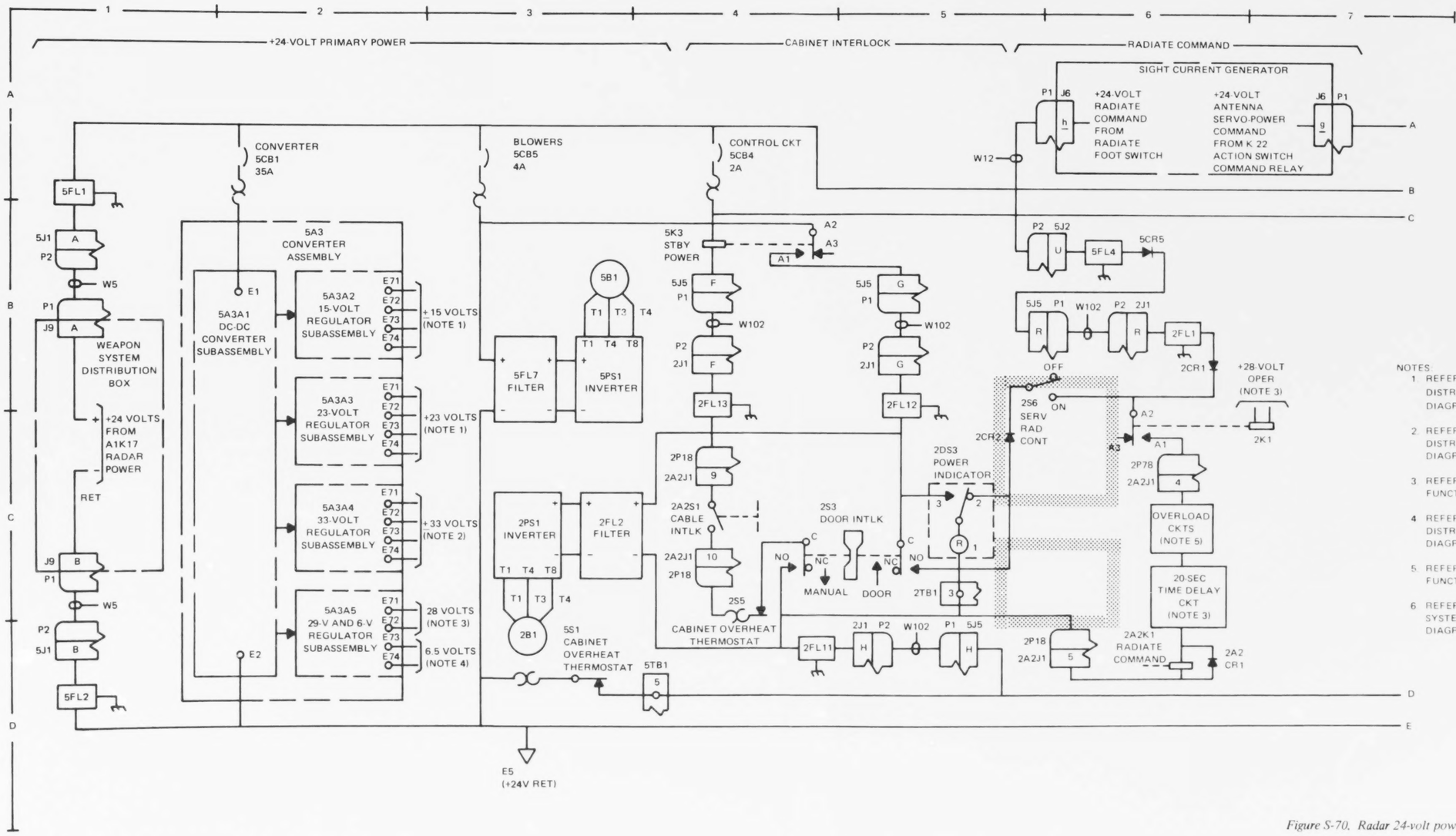
AMC84-1093 ■

Figure S-68. Radar 6,5-volt and 5-volt power distribution functional schematic diagram (sheet 2 of 2).



AMC84-1094 ■

Figure S-69. Radar 23-volt and 15-volt power distribution functional schematic diagram (sheet 2 of 2).



REFERENCE DESIGNATION	ZONE
2B1	D-3
2CR1	B-6
2CR2	C-5
2K1	C-6, C-7
2S3	C-4, C-5
2S5	C-4
2S6	B-5, B-6
2A1M1	C-6
2A2CR1	D-6
2A2K1	D-6
2A2S1	C-4
5CB1	A-2
5CB4	A-4
5CB5	A-3
5CR5	B-6
5S1	D-3

NOTES:

1. REFER TO 23-VOLT AND 15-VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.
2. REFER TO 33-VOLT AND 25-VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.
3. REFER TO 28-VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.
4. REFER TO 6.5-VOLT AND 5-VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.
5. REFER TO TRANSMITTING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
6. REFER TO ANTENNA POSITIONING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.

AMC84-1095 ■

Figure S-70. Radar 24-volt power distribution functional schematic diagram (sheet 1 of 2).

REFERENCE DESIGNATION	ZONE
1A2CR1	C-12
1A2L1	C-12
1A2S1	C-13
1A3CR1	C-9
1A3L1	C-9
1A3S1	D-9
5CB2	A-10
5CB3	A-11
5K1	C-11, C-12
5K2	C-10
5A1K1	B-8
5A1K2	B-9
5A1K3	B-9
5A2K1	B-13
5A2K2	B-12
5A2K3	A-13
6CR1	A-10
6CR2	B-10
6S1	C-8, D-8 B-10, B-11 C-13
6S2	B-10, C-10
6S3	B-11, C-11
6S4	B-10

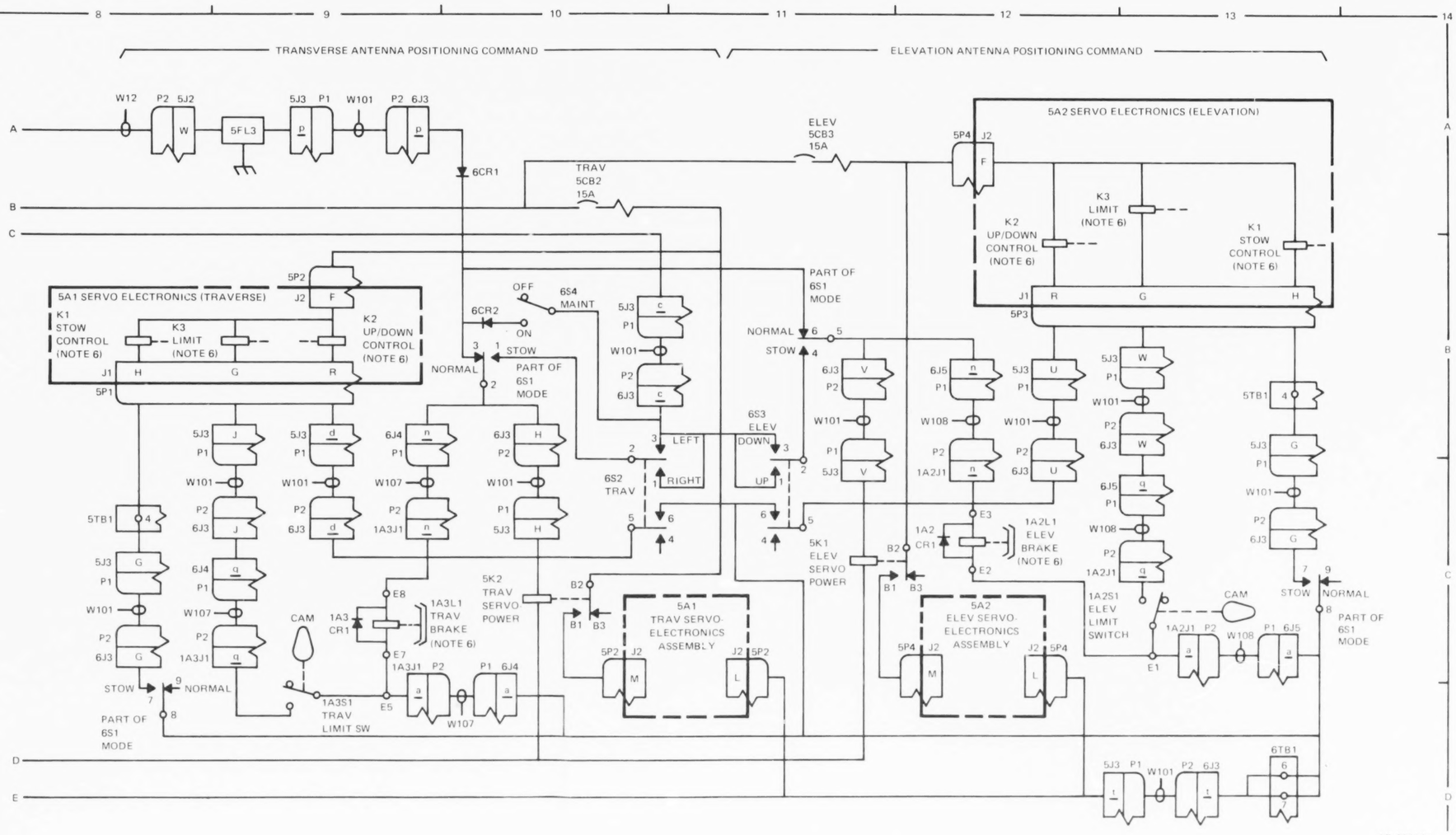
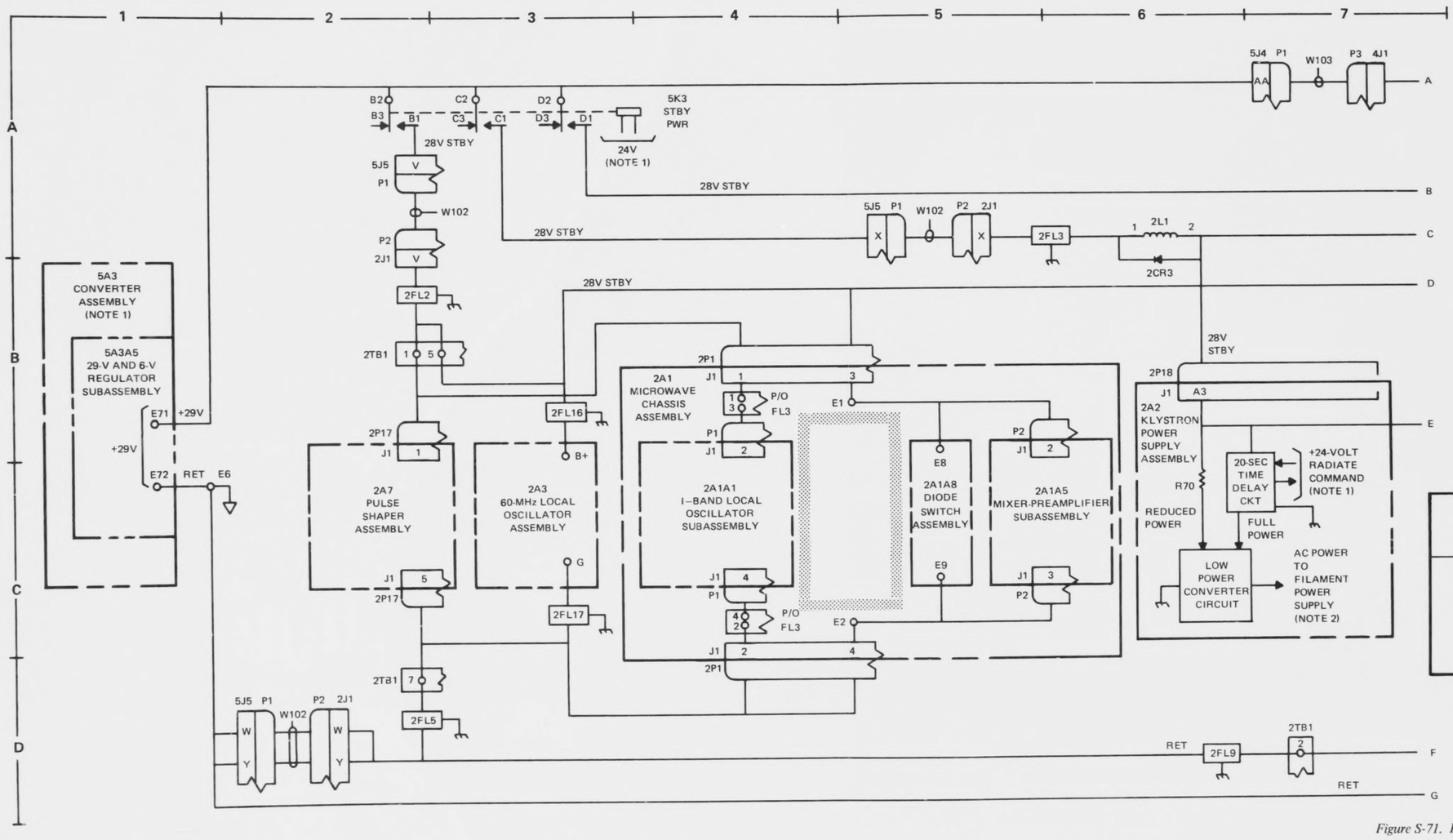


Figure S-70. Radar 24-volt power distribution functional schematic diagram (sheet 2 of 2).



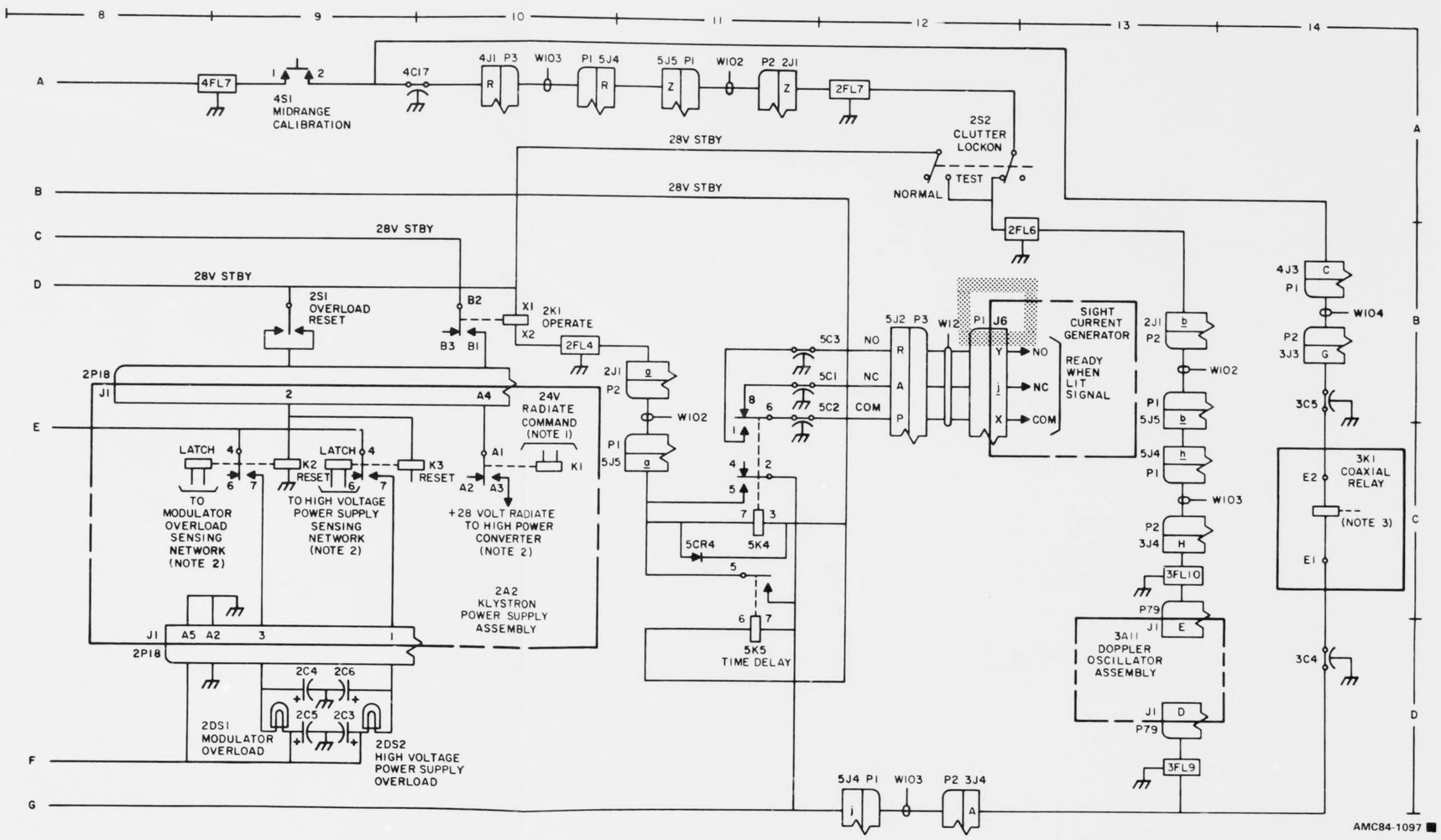
NOTES:

1. REFER TO +24-VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.
2. REFER TO TRANSMITTING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
3. REFER TO RECEIVING SYSTEM FUNCTIONAL SYSTEM DIAGRAM.

REFERENCE DESIGNATION	ZONE
2CR3	B-6
2L1	B-6
2A2R70	C-6
5K3	A-2, A-3

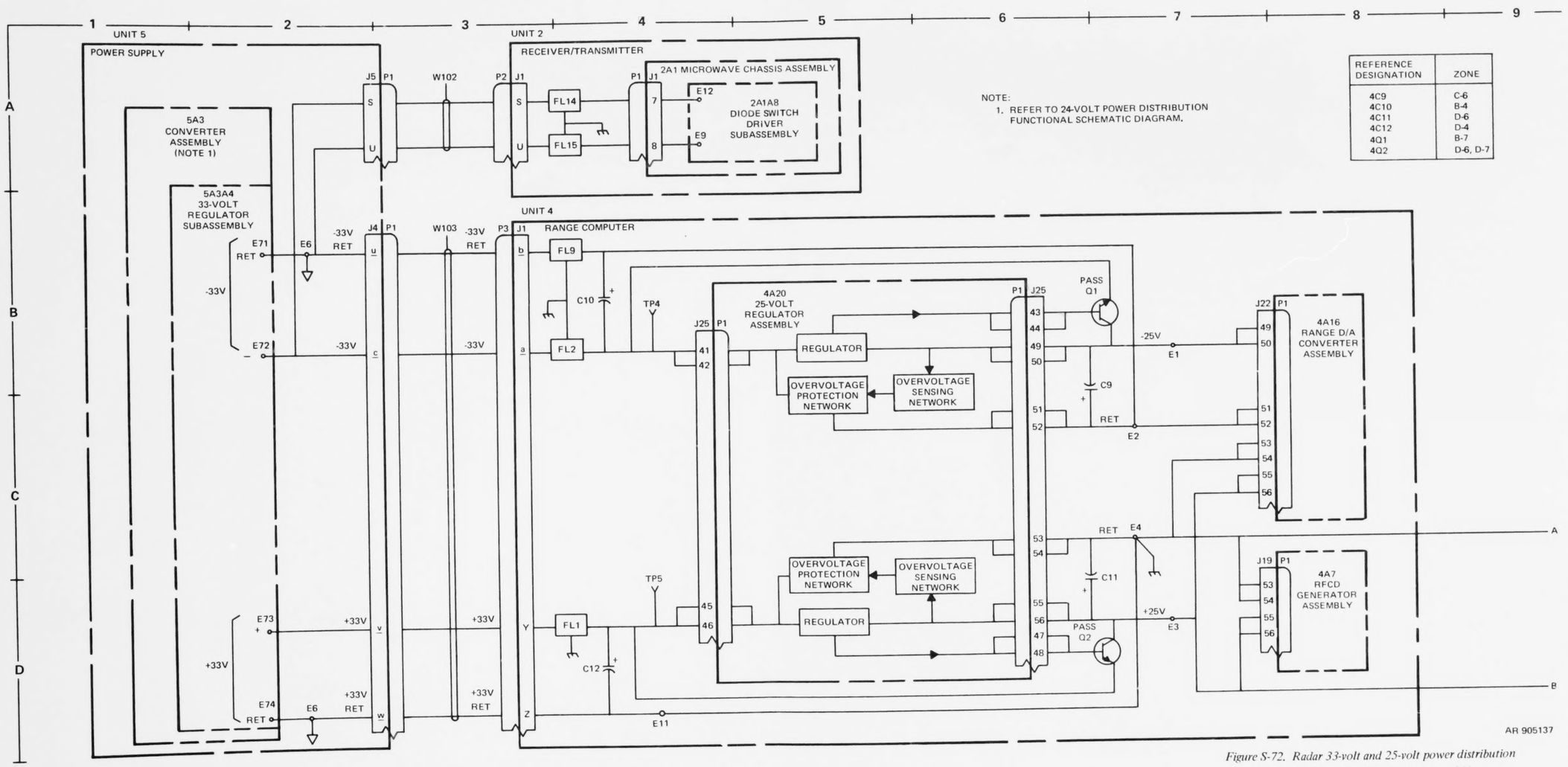
Figure S-71. Radar 28-volt power distribution functional schematic diagram (sheet 1 of 2).

REFERENCE DESIGNATION	ZONE
2C3	D-9
2C4	D-9
2C5	D-9
2C6	D-9
2DS1	D-9
2DS2	D-9
2K1	B-10
2S1	B-9
2S2	A-12, A-13
2A2K1	C-10
2A2K2	C-8, C-9
2A2K3	C-9 C-10
3C4	D-14
3C5	B-14
3K1	C-14
4C17	A-9, A-10
4S1	A-9
5C1	B-11
5C2	B-11
5C3	B-11
5CR4	C-11
5K4	B-11, C-11
5K5	C-11



AMC84-1097

Figure 8-71. Radar 28-volt power distribution functional schematic diagram (sheet 2 of 2).



NOTE:
1. REFER TO 24-VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.

REFERENCE DESIGNATION	ZONE
4C9	C-6
4C10	B-4
4C11	D-6
4C12	D-4
4Q1	B-7
4Q2	D-6, D-7

Figure S-72. Radar 33-volt and 25-volt power distribution functional schematic diagram (sheet 1 of 2).

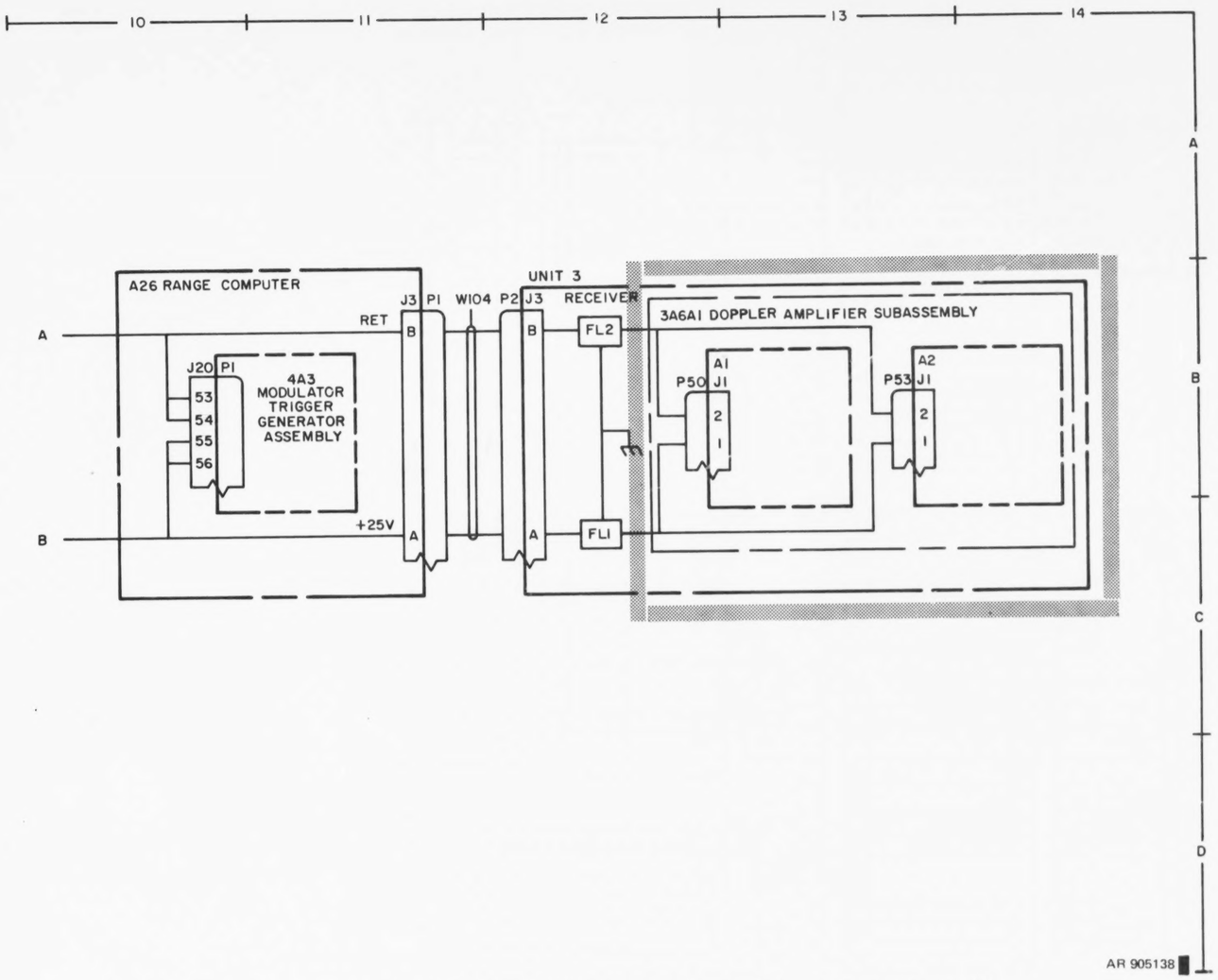
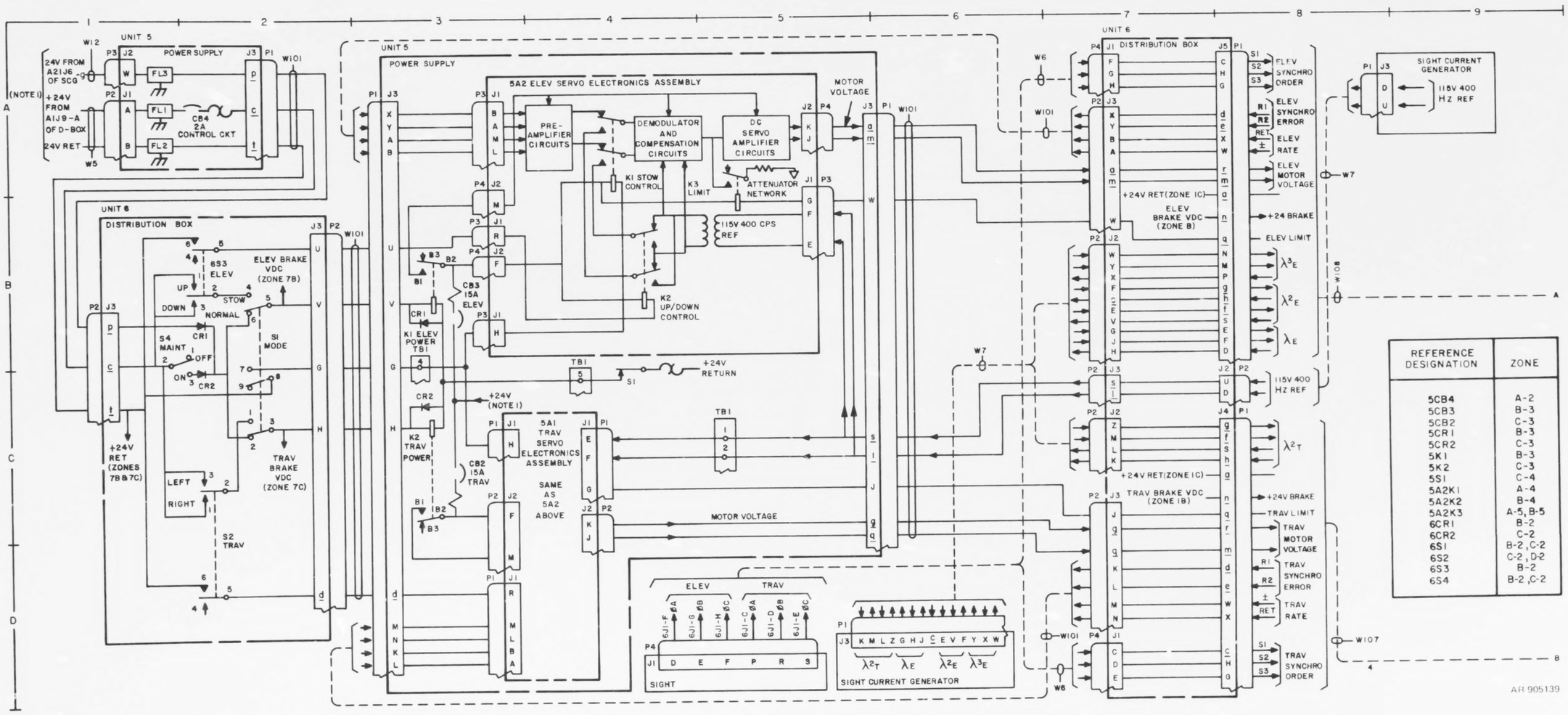


Figure S-72. Radar 33-volt and 25-volt power distribution functional schematic diagram (sheet 2 of 2).



REFERENCE DESIGNATION	ZONE
5CB4	A-2
5CB3	B-3
5CB2	C-3
5CR1	B-3
5CR2	C-3
5K1	B-3
5K2	C-3
5S1	C-4
5A2K1	A-4
5A2K2	B-4
5A2K3	A-5, B-5
6CR1	B-2
6CR2	C-2
6S1	B-2, C-2
6S2	C-2, D-2
6S3	B-2
6S4	B-2, C-2

AR 905139

NOTES:

1. REFER TO +24-VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.

Figure S-73. Radar antenna positioning system functional schematic diagram (sheet 1 of 2).

REFERENCE DESIGNATION	ZONE
1A2B1	B-11
1A2CR1	C-13
1A2L1	B-12
1A2MG1	B-12
1A2R1	D-11
1A2R2	C-11
1A2R3	C-12
1A2S1	C-12
1A3B1	D-14
1A3CR1	C-15
1A3L1	C-15
1A3MG1	C-14
1A3R1	D-15
1A3S1	D-15

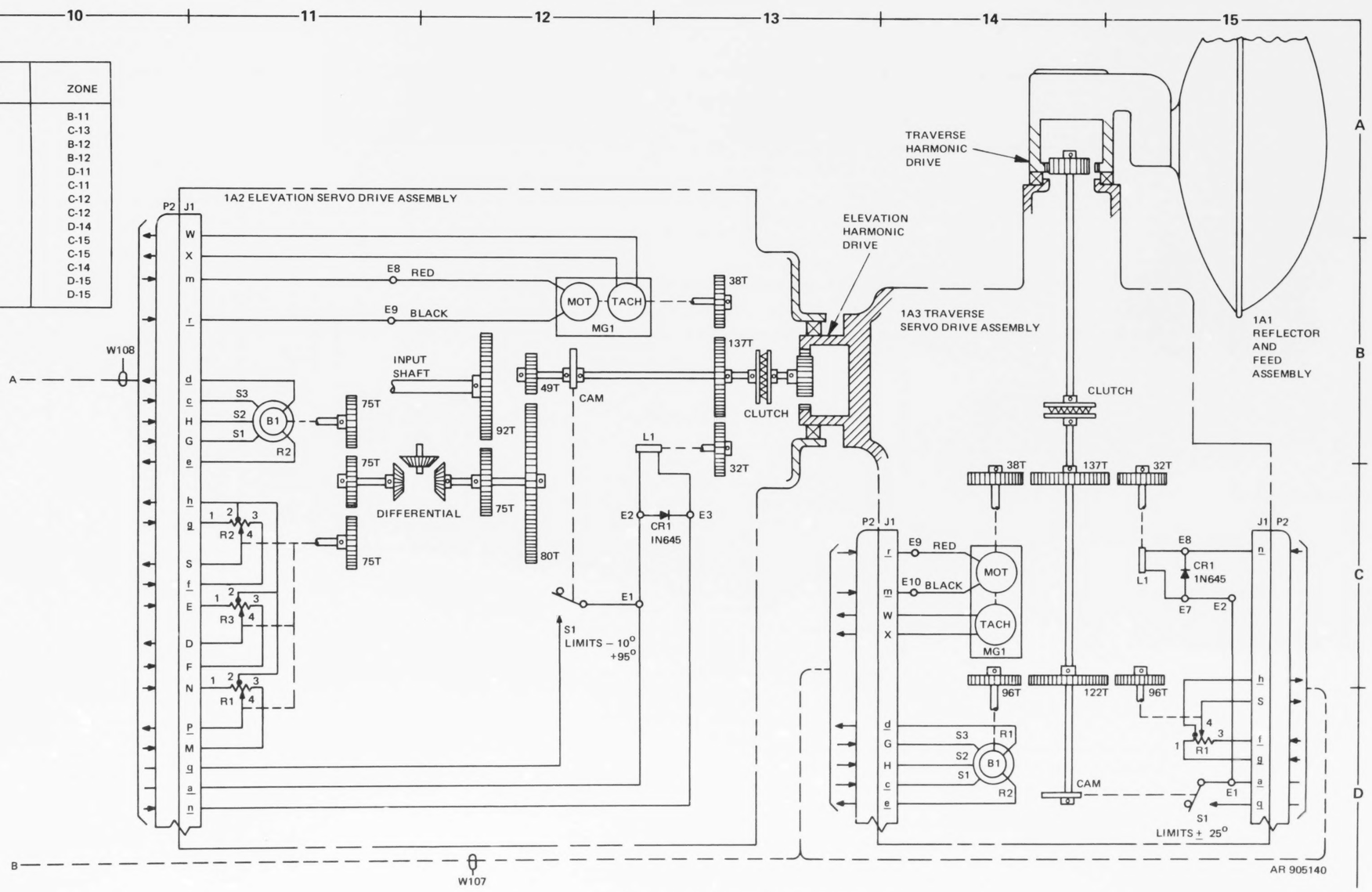
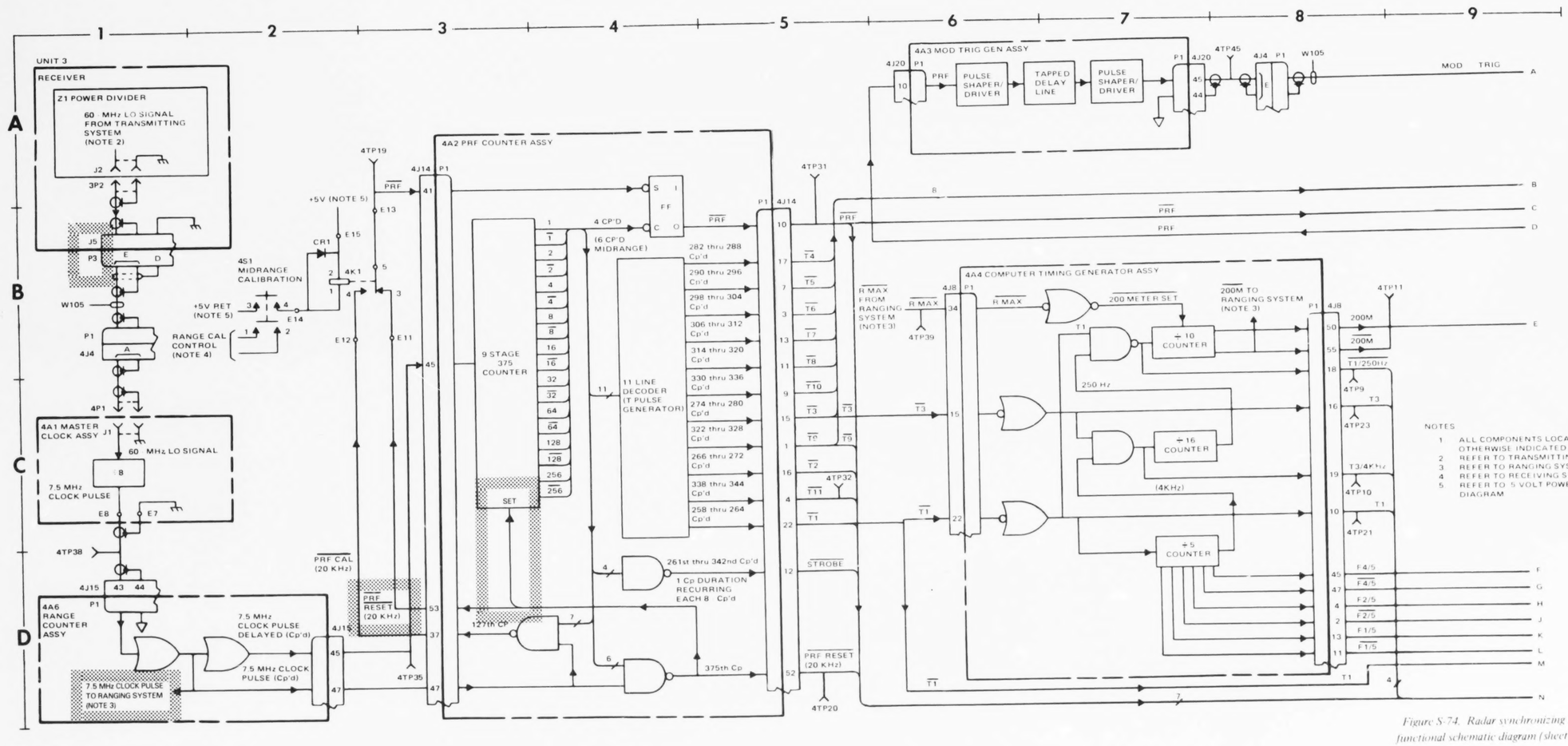


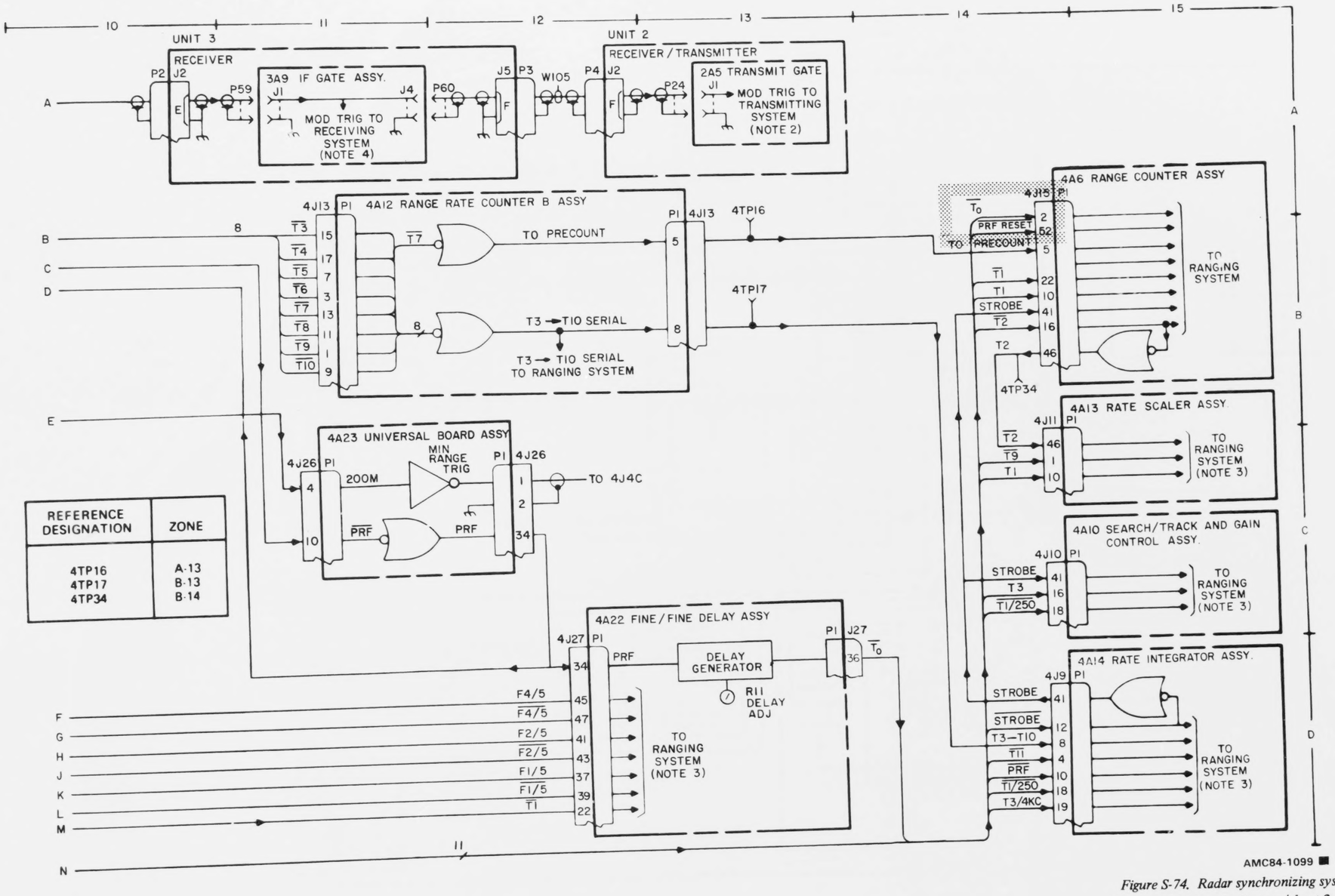
Figure S-73. Radar antenna positioning system functional schematic diagram (sheet 2 of 2).


UNIT 3
RECEIVER
Z1 POWER DIVIDER
60 MHz LO SIGNAL FROM TRANSMITTING SYSTEM (NOTE 2)
4A1 MASTER CLOCK ASSY
60 MHz LO SIGNAL
7.5 MHz CLOCK PULSE
4A2 PRF COUNTER ASSY
9 STAGE 375 COUNTER
11 LINE DECODER (T PULSE GENERATOR)
4 CP'D
(6 CP'D MIDRANGE)
282 thru 288 Cp'd
290 thru 296 Cp'd
298 thru 304 Cp'd
306 thru 312 Cp'd
314 thru 320 Cp'd
330 thru 336 Cp'd
274 thru 280 Cp'd
322 thru 328 Cp'd
266 thru 272 Cp'd
338 thru 344 Cp'd
258 thru 264 Cp'd
261st thru 342nd Cp'd
1 Cp DURATION RECURRING EACH 8 Cp'd
127th CP
375th Cp
SET
PRF RESET (20 KHz)
PRF CAL (20 KHz)
4S1 MIDRANGE CALIBRATION
RANGE CAL CONTROL (NOTE 4)
+5V (NOTE 5)
+5V RET (NOTE 5)
4A3 MOD TRIG GEN ASSY
PULSE SHAPER/ DRIVER
TAPPED DELAY LINE
PULSE SHAPER/ DRIVER
MOD TRIG
4A4 COMPUTER TIMING GENERATOR ASSY
R MAX FROM RANGING SYSTEM (NOTE 3)
200 METER SET
200M TO RANGING SYSTEM (NOTE 3)
÷ 10 COUNTER
÷ 16 COUNTER
÷ 5 COUNTER
250 Hz
(4KHz)
STROBE
4A6 RANGE COUNTER ASSY
7.5 MHz CLOCK PULSE DELAYED (Cp'd)
7.5 MHz CLOCK PULSE (Cp'd)
7.5 MHz CLOCK PULSE TO RANGING SYSTEM (NOTE 3)
NOTES
1. ALL COMPONENTS LOCATED IN RANGE COMPUTER UNIT 4 UNLESS OTHERWISE INDICATED.
2. REFER TO TRANSMITTING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM
3. REFER TO RANGING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM
4. REFER TO RECEIVING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM
5. REFER TO 5 VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM

REFERENCE DESIGNATION	ZONE
4CR1	B 2
4K1	B 2, B 3
4S1	B 2
4TP9	C 8
4TP10	C 8
4TP11	B 8, B 9
4TP19	A 3
4TP20	D 5
4TP21	D 8
4TP23	C 8
4TP31	A 5
4TP32	C 5
4TP35	D 3
4TP38	C 1, D 1
4TP39	B 6
4TP45	A 8

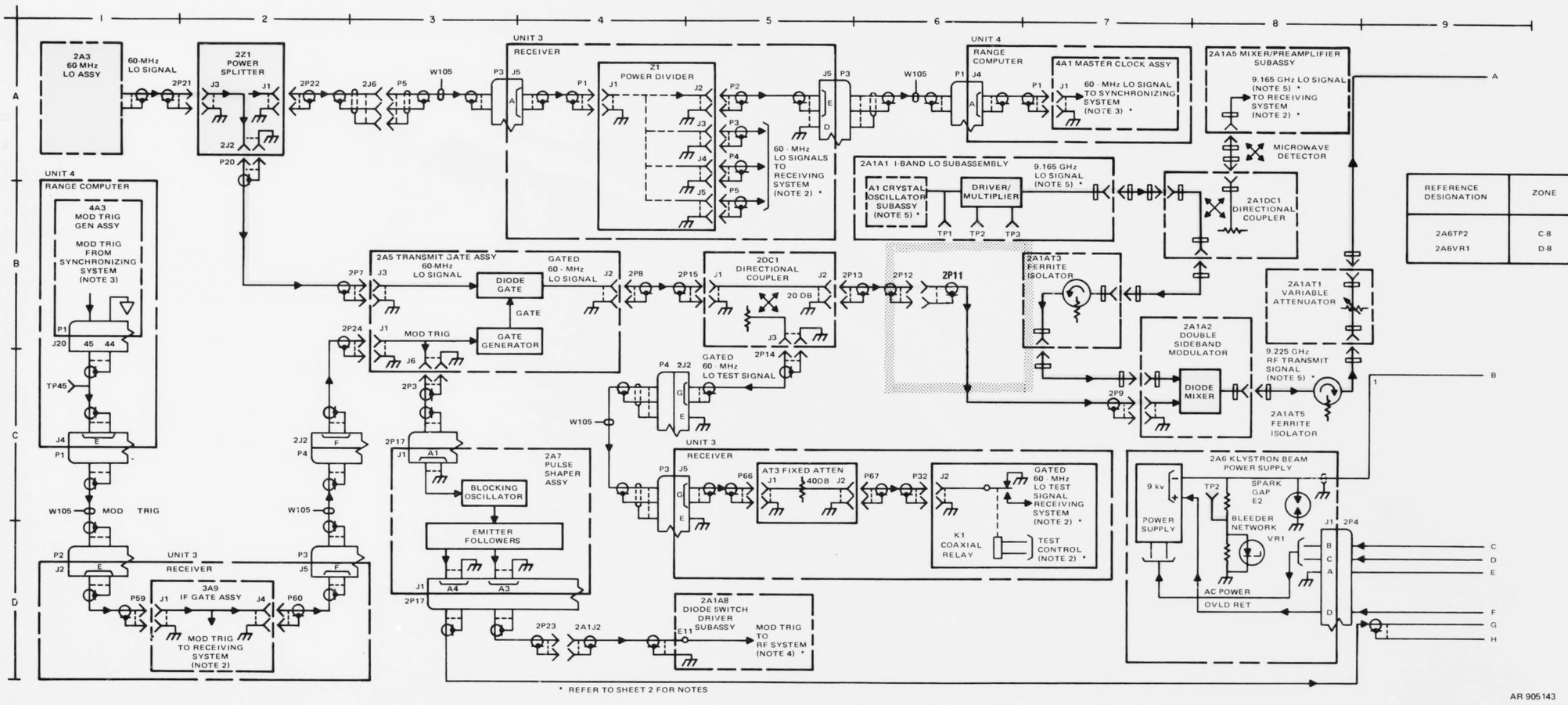
AMC84-1098 ■

Figure 8-74. Radar synchronizing system functional schematic diagram (sheet 1 of 2).



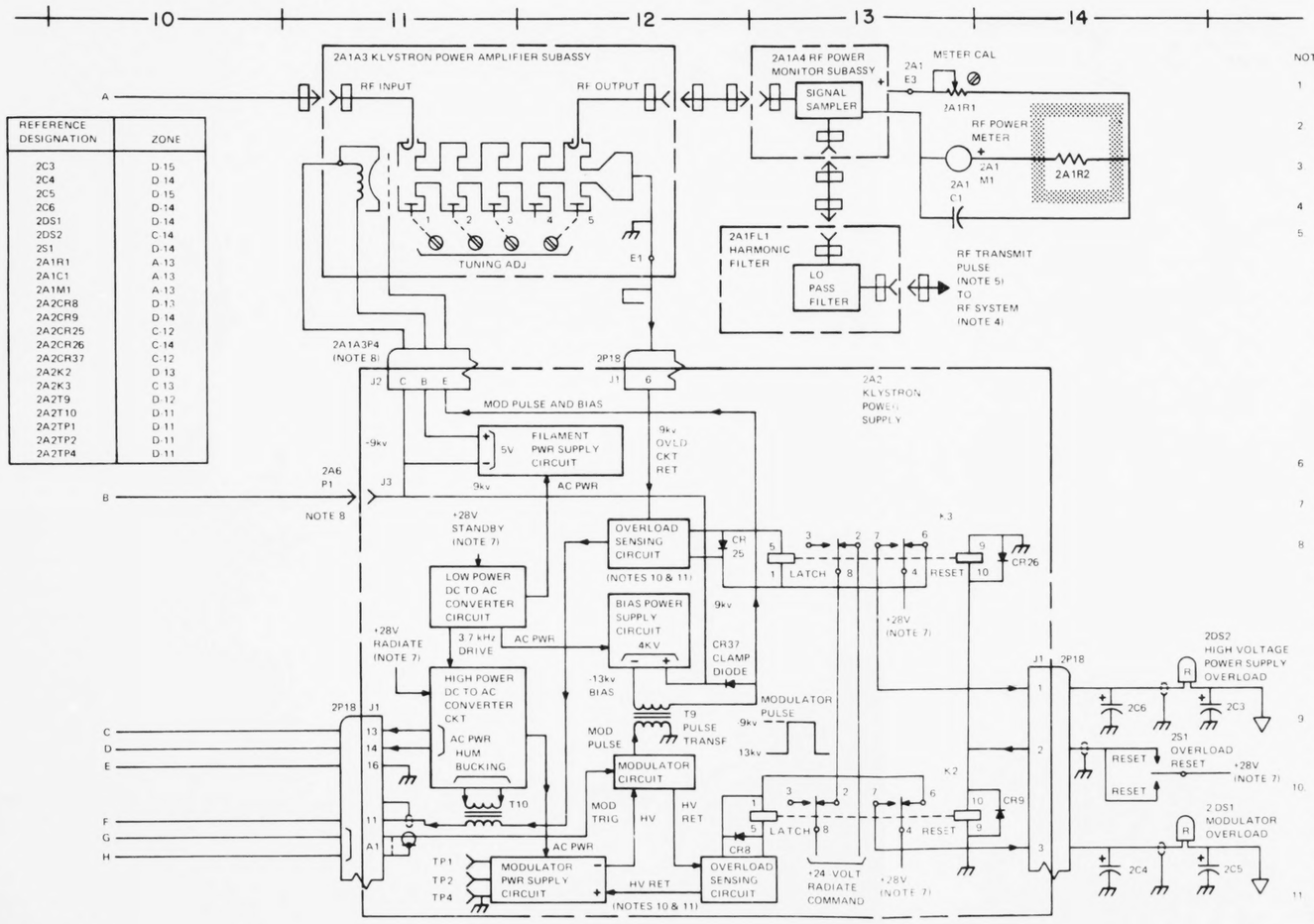
AMC84-1099 ■

Figure S-74. Radar synchronizing system functional schematic diagram (sheet 2 of 2).


2A3 60 MHz LO ASSY
60-MHz LO SIGNAL
2Z1 POWER SPLITTER
UNIT 3 RECEIVER
Z1 POWER DIVIDER
60-MHz LO SIGNALS TO RECEIVING SYSTEM (NOTE 2) *
UNIT 4 RANGE COMPUTER
4A1 MASTER CLOCK ASSY
60-MHz LO SIGNAL TO SYNCHRONIZING SYSTEM (NOTE 3) *
2A1A5 MIXER/PREAMPLIFIER SUBASSY
9.165 GHz LO SIGNAL (NOTE 5) * TO RECEIVING SYSTEM (NOTE 2) *
MICROWAVE DETECTOR
2A1A1 I-BAND LO SUBASSEMBLY
A1 CRYSTAL OSCILLATOR SUBASSY (NOTE 5) *
DRIVER/ MULTIPLIER
9.165 GHz LO SIGNAL (NOTE 5) *
2A1DC1 DIRECTIONAL COUPLER
UNIT 4 RANGE COMPUTER
4A3 MOD TRIG GEN ASSY
MOD TRIG FROM SYNCHRONIZING SYSTEM (NOTE 3)
2A5 TRANSMIT GATE ASSY
60-MHz LO SIGNAL
DIODE GATE
GATED 60-MHz LO SIGNAL
GATE
MOD TRIG
GATE GENERATOR
2DC1 DIRECTIONAL COUPLER
20 DB
2A1AT3 FERRITE ISOLATOR
2A1AT1 VARIABLE ATTENUATOR
2A1A2 DOUBLE SIDEBAND MODULATOR
DIODE MIXER
9.225 GHz RF TRANSMIT SIGNAL (NOTE 5) *
2A1AT5 FERRITE ISOLATOR
GATED 60-MHz LO TEST SIGNAL
2A7 PULSE SHAPER ASSY
BLOCKING OSCILLATOR
EMITTER FOLLOWERS
UNIT 3 RECEIVER
AT3 FIXED ATTEN 40DB
K1 COAXIAL RELAY
GATED 60-MHz LO TEST SIGNAL RECEIVING SYSTEM (NOTE 2) *
TEST CONTROL (NOTE 2) *
2A6 KLYSTRON BEAM POWER SUPPLY
9 kv
POWER SUPPLY
SPARK GAP E2
BLEEDER NETWORK
VR1
AC POWER
OVLD RET
MOD TRIG
W105
3A9 IF GATE ASSY
MOD TRIG TO RECEIVING SYSTEM (NOTE 2)
2A1A8 DIODE SWITCH DRIVER SUBASSY
MOD TRIG TO RF SYSTEM (NOTE 4) *
* REFER TO SHEET 2 FOR NOTES
AR 905143

REFERENCE DESIGNATION	ZONE
2A6TP2	C-8
2A6VR1	D-8

Figure S-75. Radar transmitting system functional schematic diagram (sheet 1 of 2).



REFERENCE DESIGNATION	ZONE
2C3	D-15
2C4	D-14
2C5	D-15
2C6	D-14
2DS1	D-14
2DS2	C-14
2S1	D-14
2A1R1	A-13
2A1C1	A-13
2A1M1	A-13
2A2CR8	D-13
2A2CR9	D-14
2A2CR25	C-12
2A2CR26	C-14
2A2CR37	C-12
2A2K2	D-13
2A2K3	C-13
2A2T9	D-12
2A2T10	D-11
2A2TP1	D-11
2A2TP2	D-11
2A2TP4	D-11

NOTES

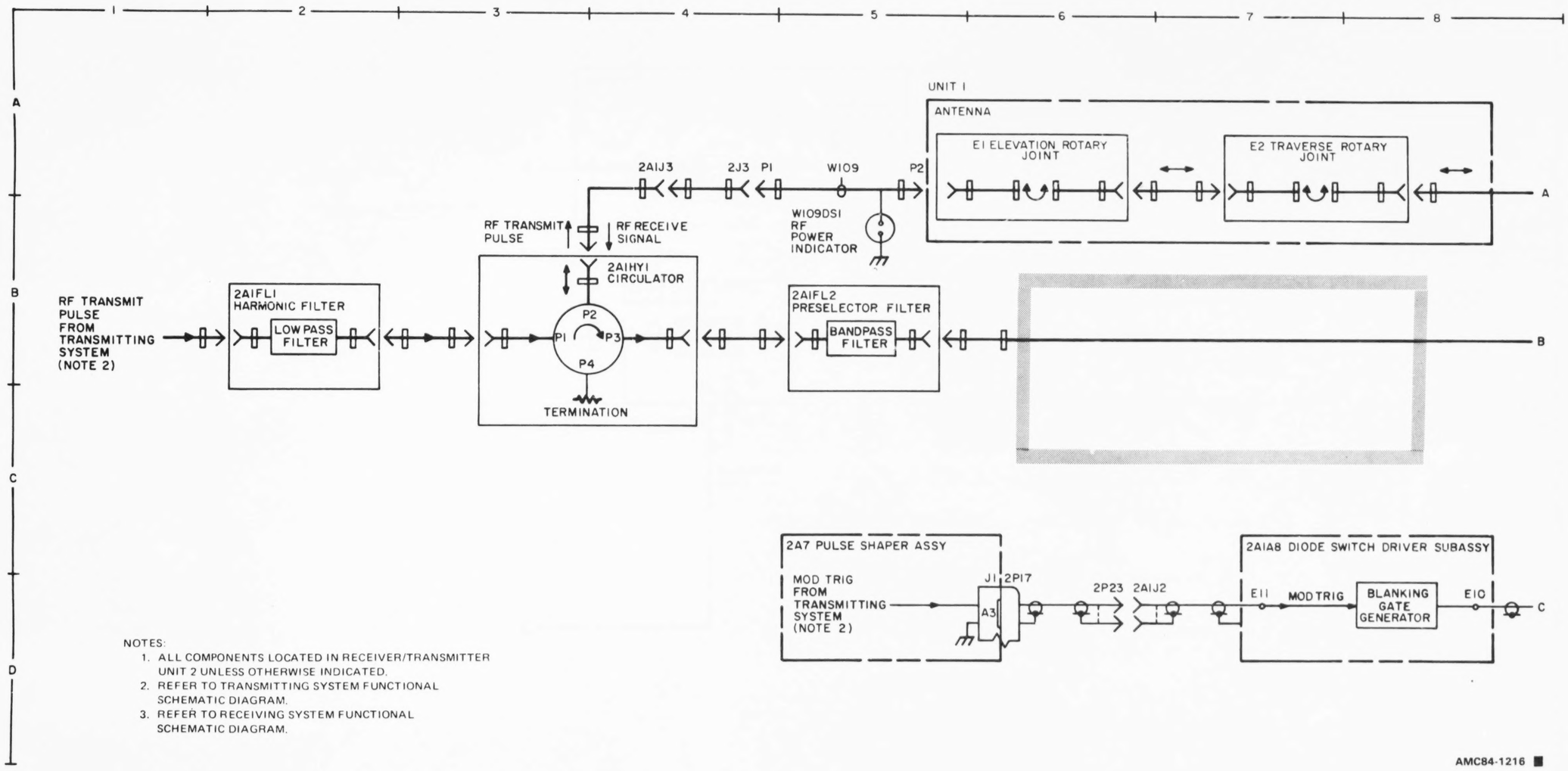
1. ALL COMPONENTS LOCATED IN TRANSMITTER/RECEIVER UNIT 2 UNLESS OTHERWISE INDICATED.
2. REFER TO RECEIVING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
3. REFER TO SYNCHRONIZING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
4. REFER TO RF SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
5. NOMINAL FREQUENCIES ARE SHOWN FOR L BAND LO SIGNAL (9.165 GHz) AND RF TRANSMIT PULSE (9.225 GHz). ANY ONE OF SIX SPECIFIC FREQUENCIES CAN BE USED. FREQUENCIES ARE DETERMINED BY CRYSTAL OSCILLATOR SUBASSEMBLY 2A1A1A1 AND ARE AS FOLLOWS:

CRYSTAL OSCILLATOR SUBASSEMBLY CHANNEL NO.	L BAND LO SIGNAL FREQUENCY (GHz)	RF TRANSMIT SIGNAL FREQUENCY (GHz)
1	9.145	9.205
2	9.153	9.213
3	9.161	9.221
4	9.169	9.229
5	9.177	9.237
6	9.185	9.245

6. REFER TO 24 VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.
7. REFER TO +28 VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.
8. PLUGS 2A6P1 AND 2A1A3P4 ARE SECURED TO THEIR MATING JACKS ON THE KLYSTRON POWER SUPPLY ASSEMBLY BY MEANS OF AN INTERLOCK PLATE ASSEMBLY. THE INTERLOCK PLATE ASSEMBLY INSURES THAT BOTH PLUGS ARE DISCONNECTED AT THE SAME TIME. THIS PREVENTS ACCIDENTAL DISCONNECTION OF THE KLYSTRON POWER AMPLIFIER SUBASSEMBLY LOAD FROM THE KLYSTRON BEAM POWER SUPPLY ASSEMBLY. IN ADDITION, THE INTERLOCK PLATE ASSEMBLY DEENERGIZES INTERLOCK SWITCH 2A2S1, WHICH IN TURN DEENERGIZES THE CABINET INTERLOCK CIRCUITRY REMOVING POWER FROM THE TRANSMITTER/RECEIVER. REFER TO +24 VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM FOR 2A2S1 FUNCTION.
9. INPUT/OUTPUT MAY VARY WITHIN TOLERANCES. COMPONENTS AND CIRCUITRY VARY WITH CHARACTERISTICS OF INDIVIDUAL SETS. VARIANCES OF CIRCUITRY ARE COMPATIBLE WITH UNIT FUNCTION.
10. IF HIGH VOLTAGE SUPPLY OVERLOAD 2DS2 AND MODULATOR OVERLOAD INDICATOR 2DS1 ARE NOT LIT AND RADAR WILL NOT RADIATE (WITH ACTION AND FOOT SWITCHES DEPRESSED) THE +29 VDC OVERLOAD CIRCUITRY (LIGHT PIPE) IN KLYSTRON POWER SUPPLY 2A2 MAY HAVE TRIPPED. TO RESET: TURN SYSTEM POWER SWITCH TO OFF AND THEN BACK ON. RADAR SHOULD RADIATE AFTER TWO MINUTES.
11. IF EITHER HIGH VOLTAGE SUPPLY OVERLOAD 2DS2 OR MODULATOR OVERLOAD 2DS1 INDICATOR LIGHTS (WITH ACTION AND FOOT SWITCHES DEPRESSED) AND RADAR WILL NOT RADIATE, MOMENTARILY SET OVERLOAD RESET TOGGLE SWITCH 2S1 TO "RESET" TO RESET OVERLOAD SENSING CIRCUIT.

AMC84-1101 ■

Figure S-75. Radar transmitting system functional schematic diagram (sheet 2 of 2).



NOTES:
1. ALL COMPONENTS LOCATED IN RECEIVER/TRANSMITTER UNIT 2 UNLESS OTHERWISE INDICATED.
2. REFER TO TRANSMITTING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
3. REFER TO RECEIVING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.

AMC84-1216 ■

Figure S-76. RF system functional schematic diagram (sheet 1 of 2).

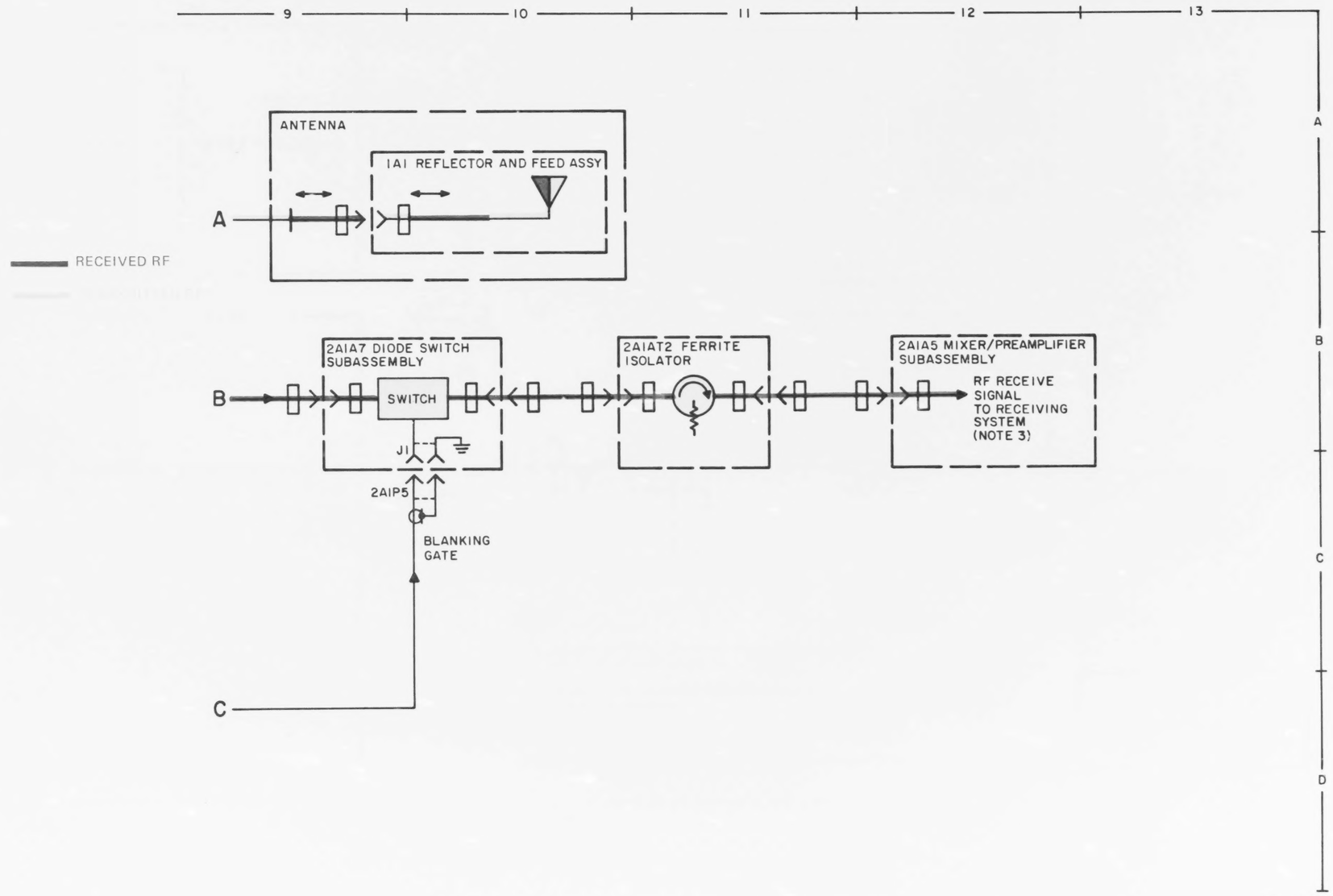
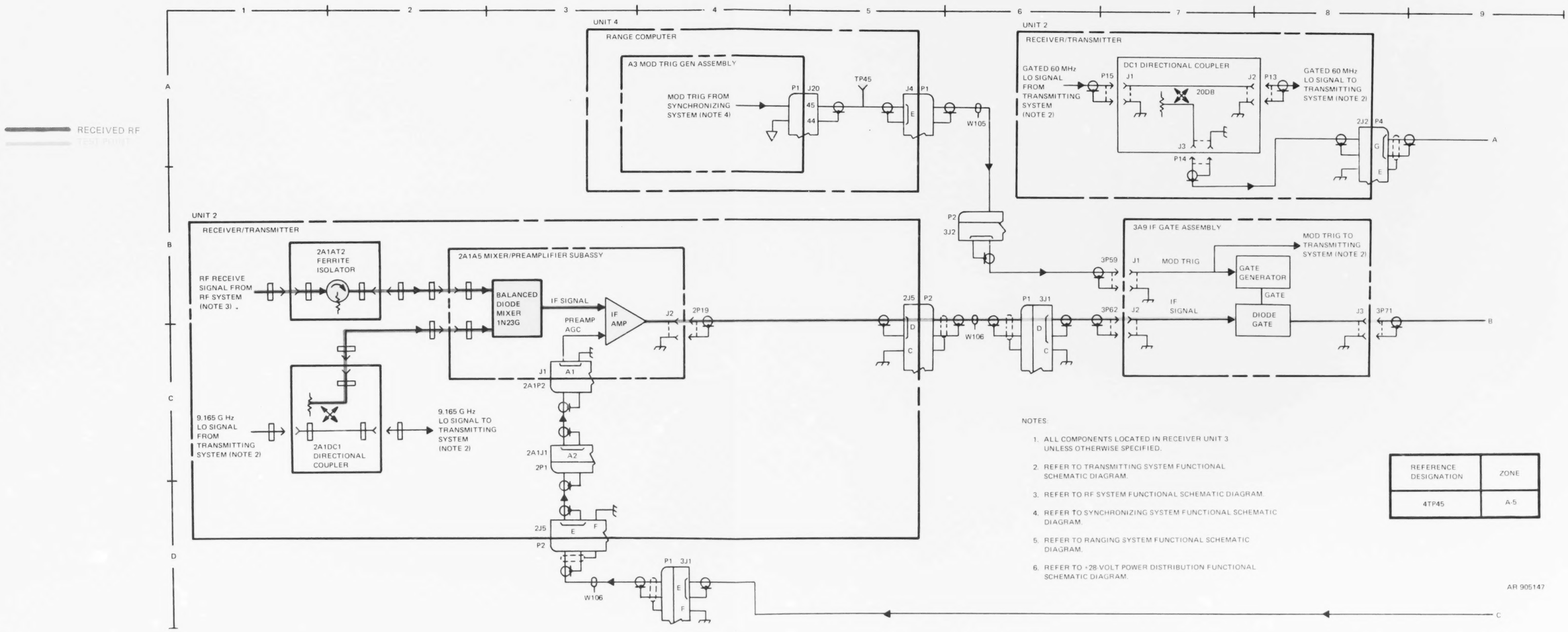


Figure S-76. RF system functional schematic diagram (sheet 2 of 2).



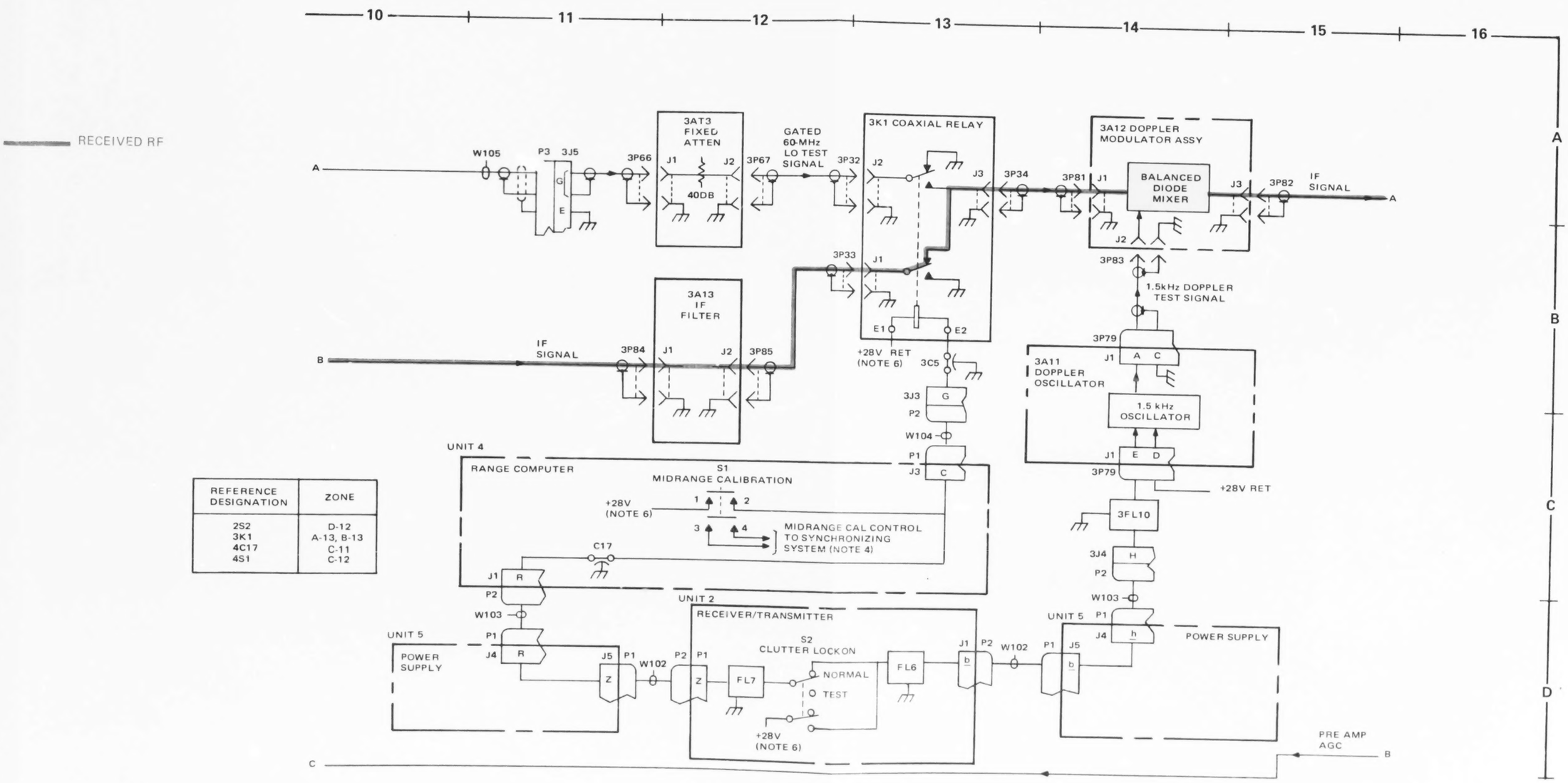
NOTES:

1. ALL COMPONENTS LOCATED IN RECEIVER UNIT 3 UNLESS OTHERWISE SPECIFIED.
2. REFER TO TRANSMITTING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
3. REFER TO RF SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
4. REFER TO SYNCHRONIZING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
5. REFER TO RANGING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
6. REFER TO +28-VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.

REFERENCE DESIGNATION	ZONE
4TP45	A-5

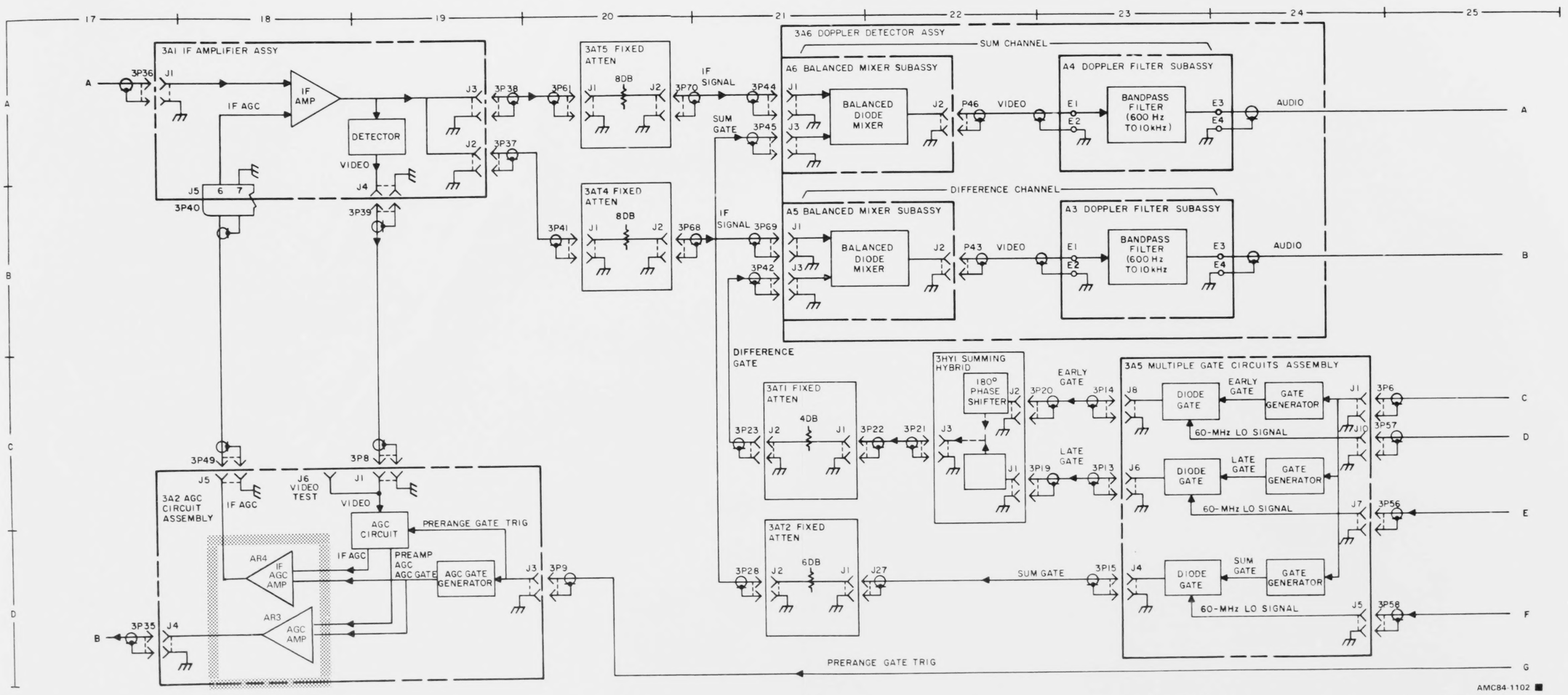
AR 905147

Figure S-77. Radar receiving system functional schematic diagram (sheet 1 of 4).



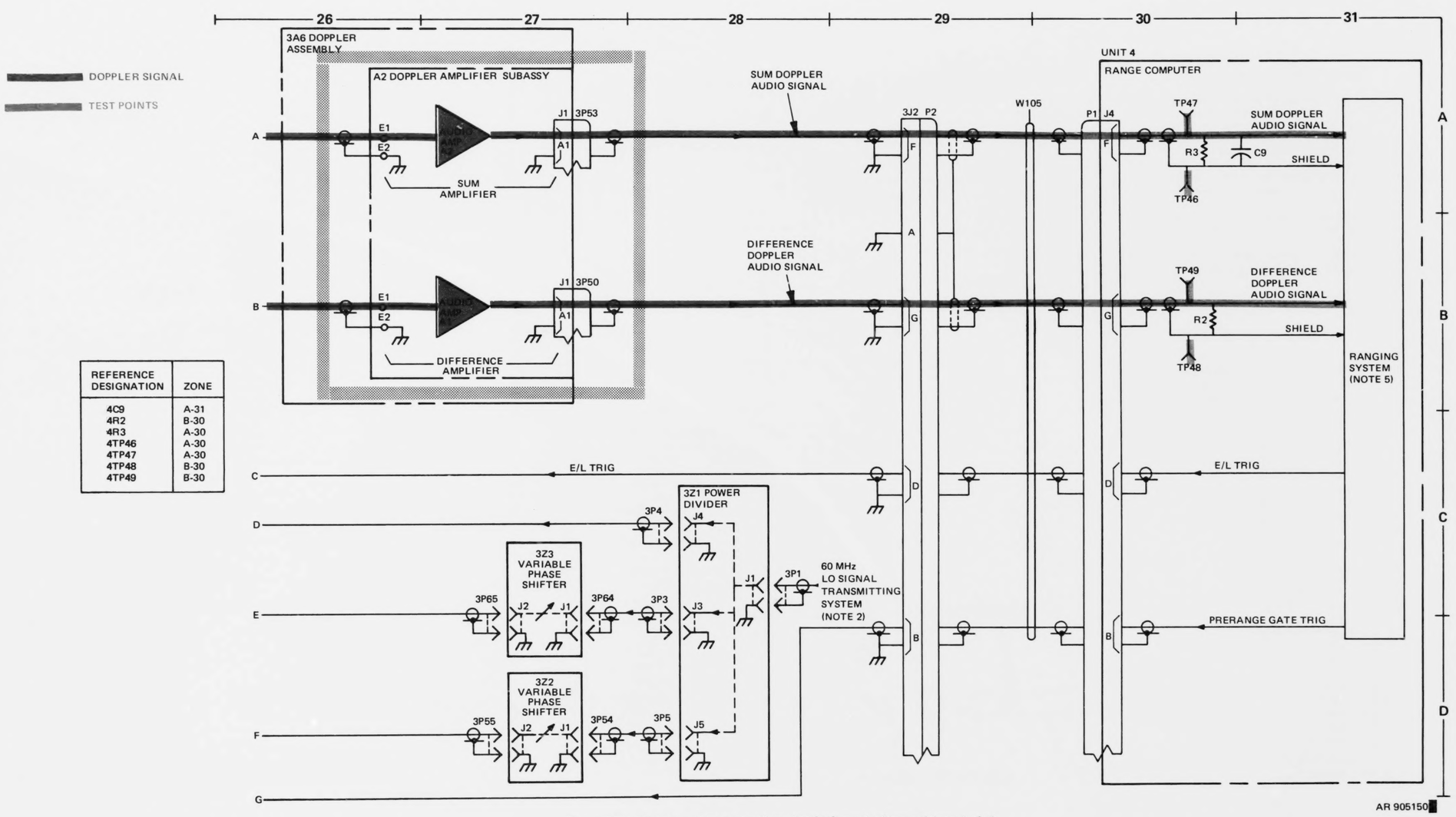
AR 505148

Figure S-77. Radar receiving system functional schematic diagram (sheet 2 of 4).



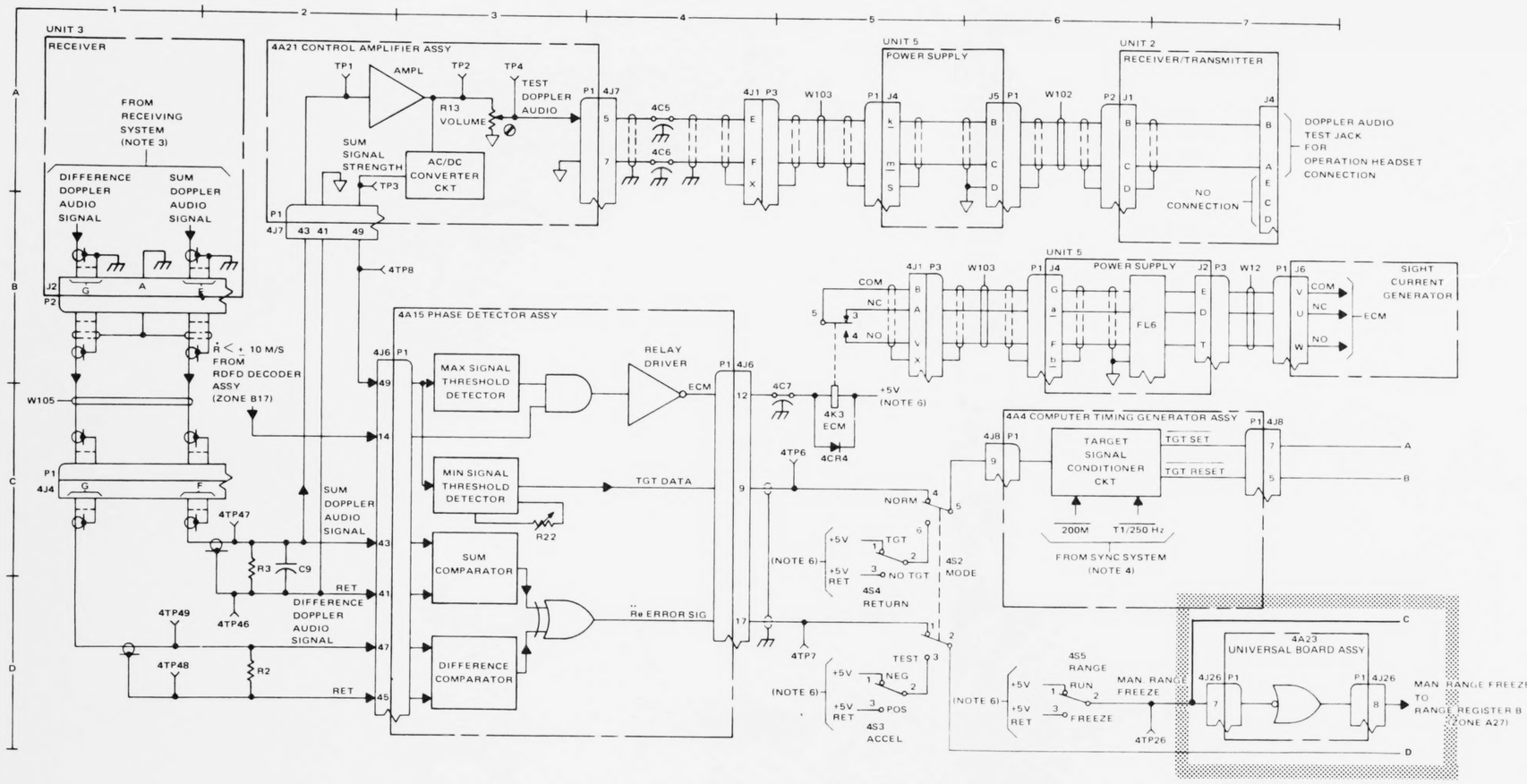
AMC84-1102 ■

Figure 5-77. Radar receiving system functional schematic diagram (sheet 3 of 4).



REFERENCE DESIGNATION	ZONE
4C9	A-31
4R2	B-30
4R3	A-30
4TP46	A-30
4TP47	A-30
4TP48	B-30
4TP49	B-30

Figure S-77. Radar receiving system functional schematic diagram (sheet 4 of 4).



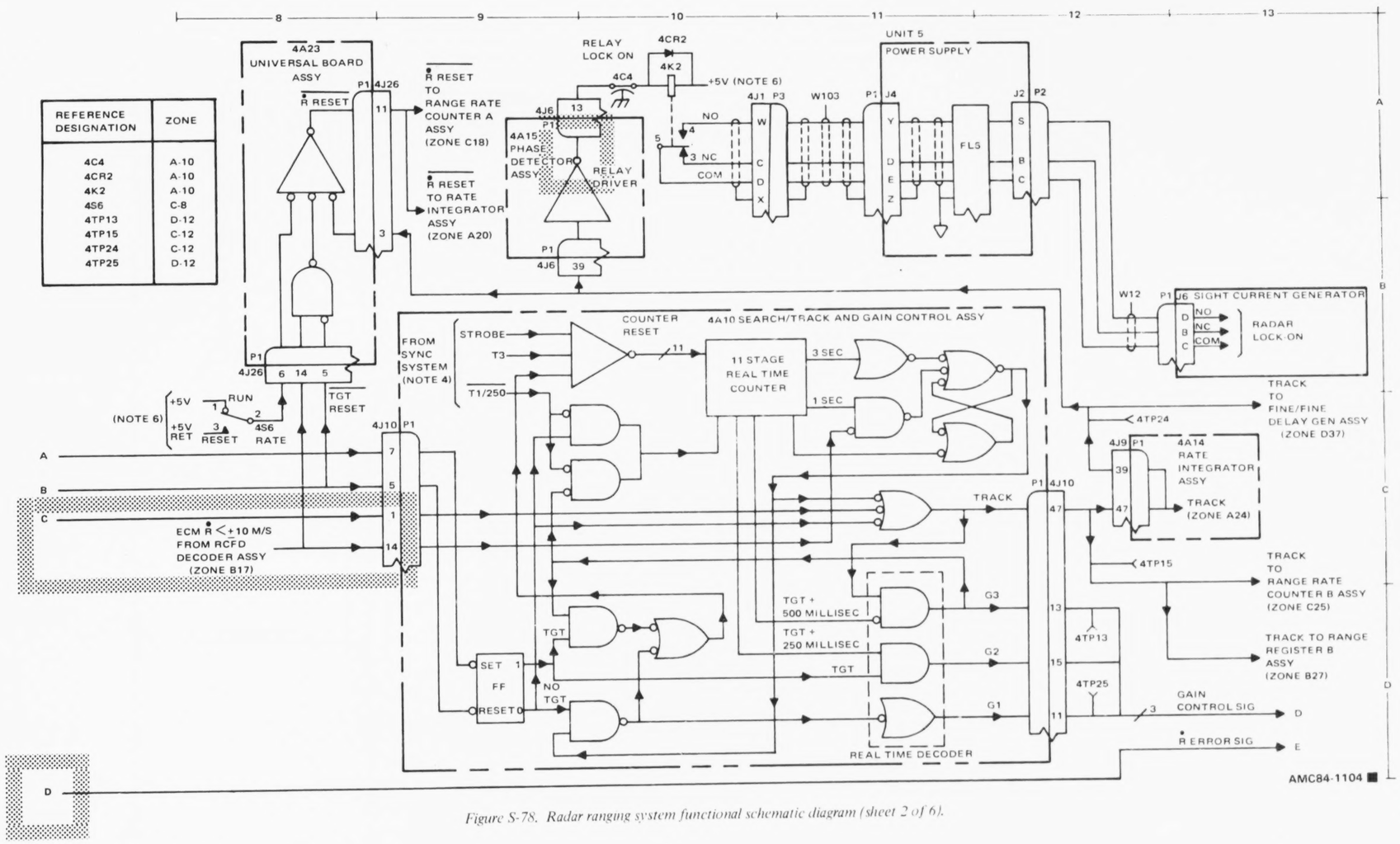
NOTES:

1. ALL COMPONENTS LOCATED IN RANGE COMPUTER UNIT 4 UNLESS OTHERWISE SPECIFIED.
2. MIDRANGE CALIBRATION INDICATOR LAMP 4DS1 BLINKS AT 1 CPS RATE DURING SEARCH MODE. IN TRACK MODE, 4DS1 ILLUMINATES WHEN TARGET RANGE IS BETWEEN 2400 METERS AND 2560 METERS.
3. REFER TO RECEIVING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
4. REFER TO SYNCHRONIZING SYSTEM FUNCTIONAL SCHEMATIC DIAGRAM.
5. REFER TO +15 VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.
6. REFER TO +5 VOLT POWER DISTRIBUTION FUNCTIONAL SCHEMATIC DIAGRAM.

REFERENCE DESIGNATION	ZONE
4C5	A 4
4C6	A 4
4C7	C 5
4C9	C 2, D 2
4CR4	C 5
4K3	B 5, C 5
4R2	D 2
4R3	C 2, D 2
4S2	C 5, D 5
4S3	D 5
4S4	C 5
4S5	D 6
4TPC	C 5
4TP7	D 5
4TP8	B 2
4TP26	D 6
4TP46	D 2
4TP47	C 2
4TP48	D 1
4TP49	D 1
4A21R13	A 3
4A21TP1	A 2
4A21TP2	A 3
4A21TP3	A 2
4A21TP4	A 3

AMC84-1103 ■

Figure 5-78. Radar ranging system functional schematic diagram (sheet 1 of 6).



REFERENCE DESIGNATION	ZONE
4C4	A-10
4CR2	A-10
4K2	A-10
4S6	C-8
4TP13	D-12
4TP15	C-12
4TP24	C-12
4TP25	D-12

Figure S-78. Radar ranging system functional schematic diagram (sheet 2 of 6).

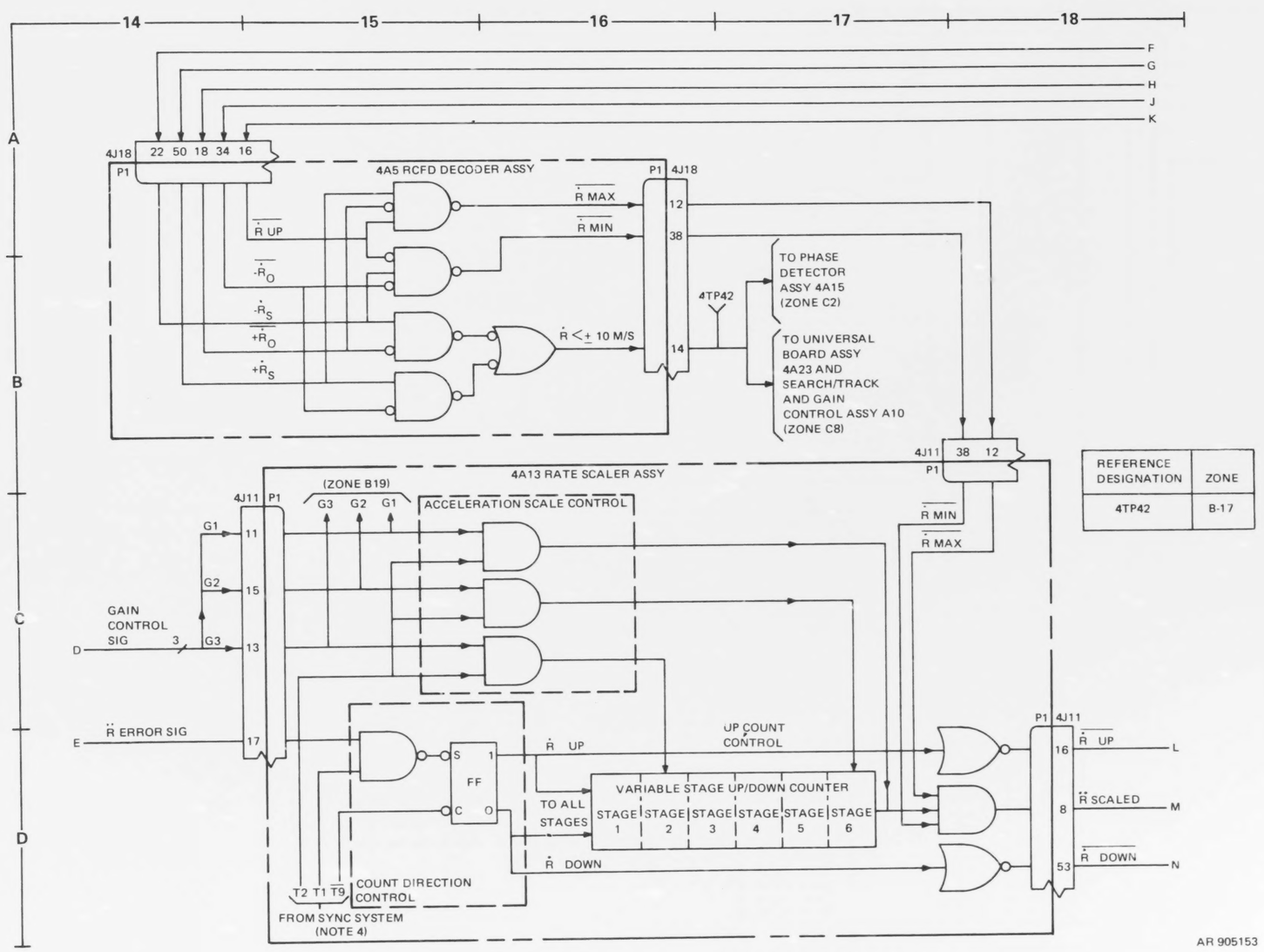
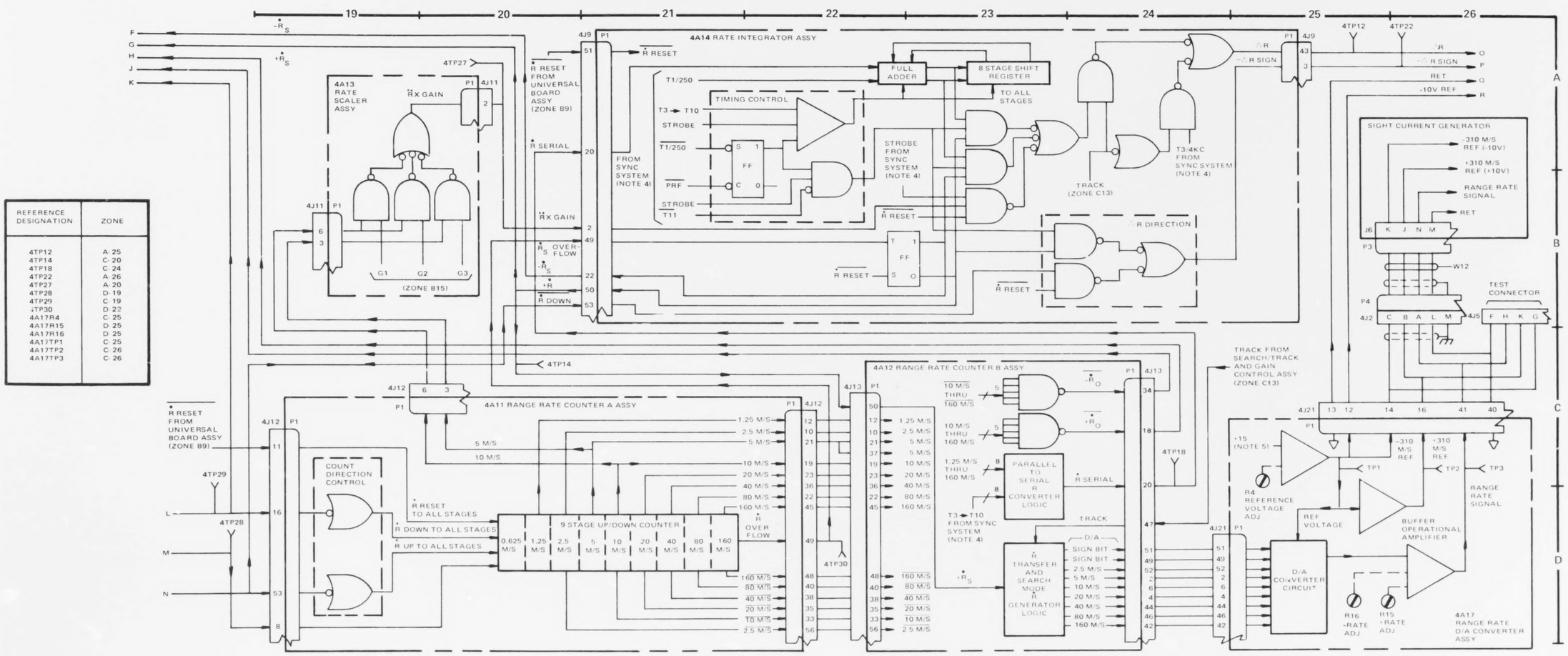


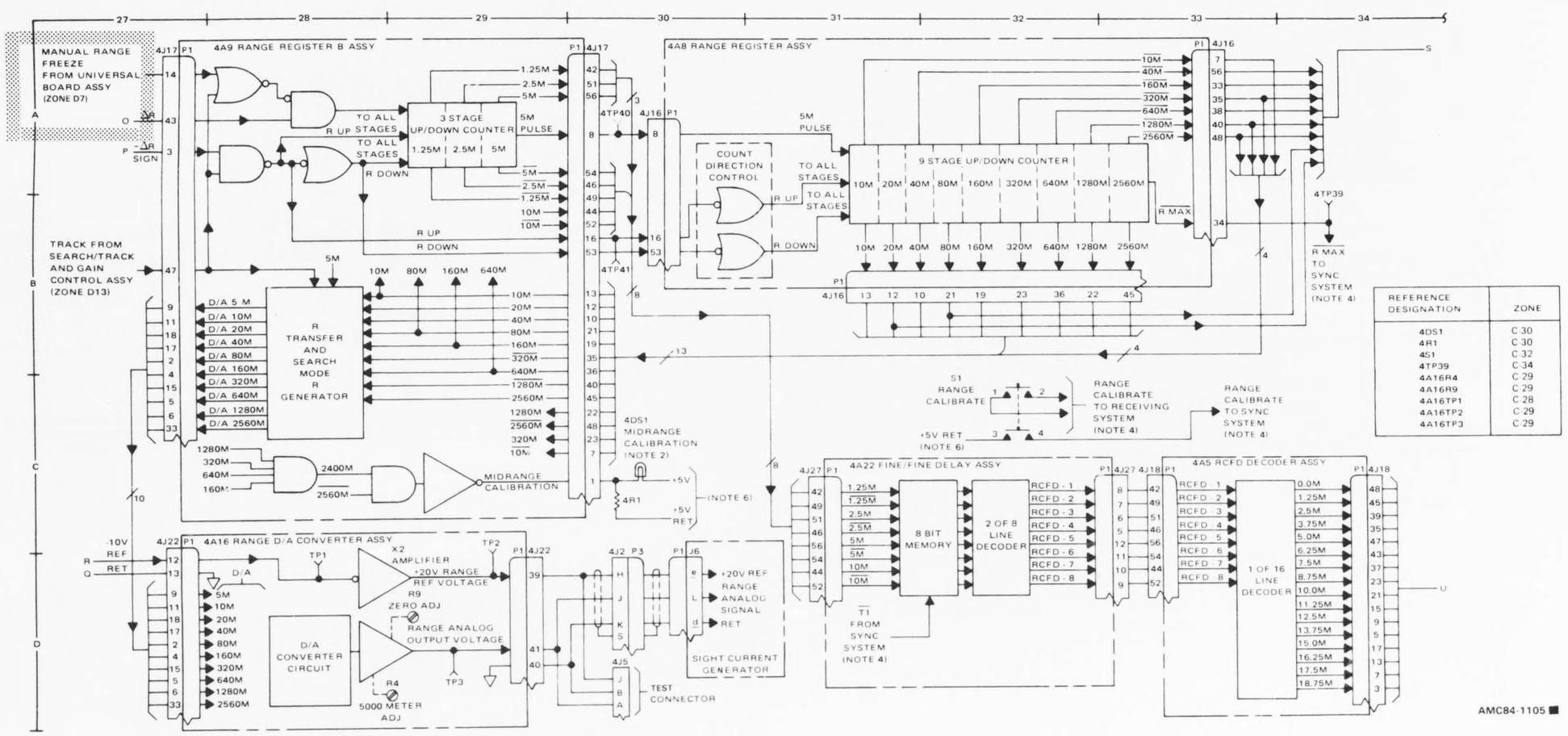
Figure S-78. Radar ranging system functional schematic diagram (sheet 3 of 6).

REFERENCE DESIGNATION	ZONE
4TP12	A-25
4TP14	C-20
4TP18	C-24
4TP22	A-26
4TP27	A-20
4TP28	D-19
4TP29	C-19
4TP30	D-22
4A17R4	C-25
4A17R15	D-25
4A17R16	D-25
4A17TP1	C-25
4A17TP2	C-26
4A17TP3	C-26



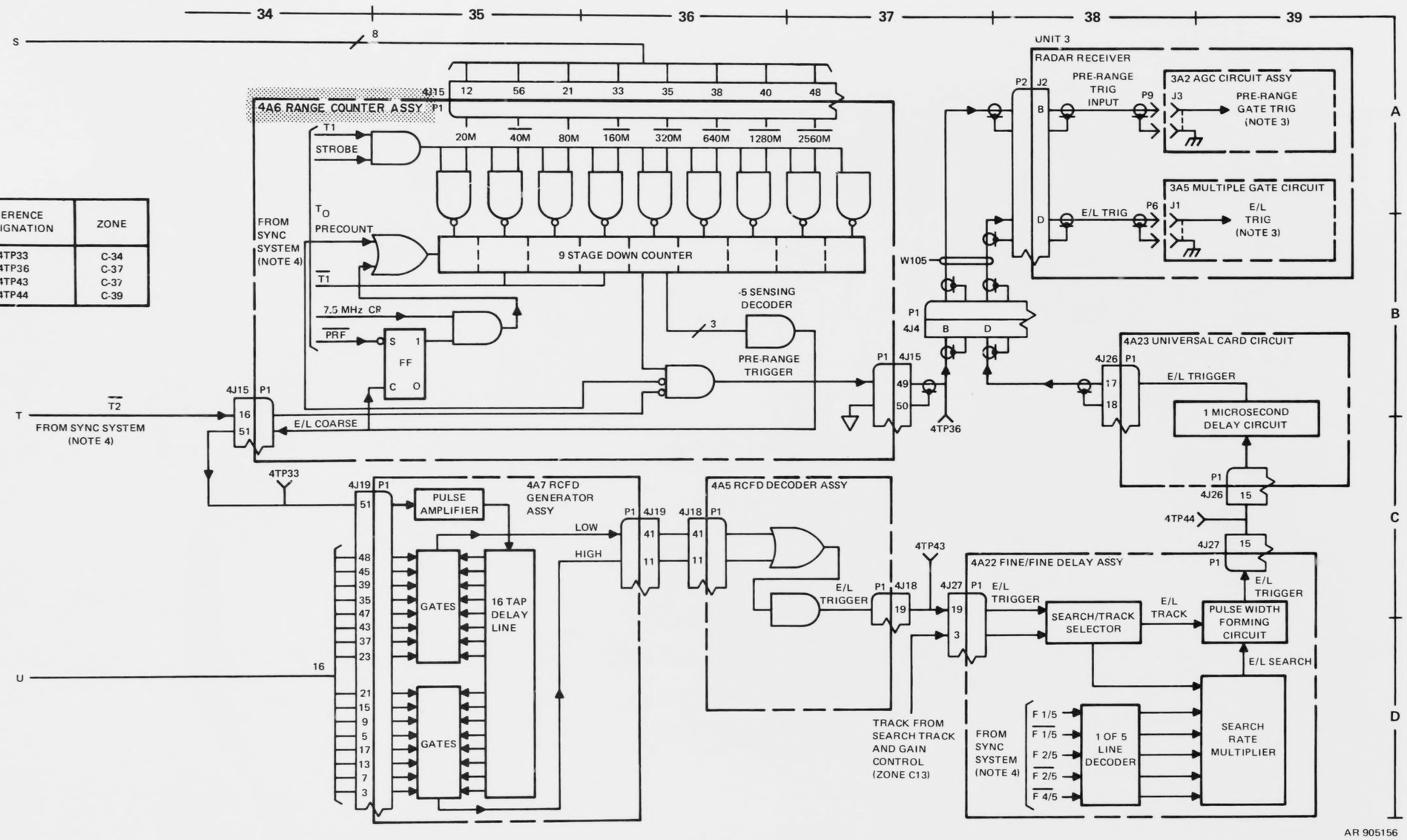
AR 905154

Figure S-78. Radar ranging system functional schematic diagram (sheet 4 of 6).



AMC84-1105 ■

Figure 5-78. Radar ranging system functional schematic diagram (sheet 5 of 6).



REFERENCE DESIGNATION	ZONE
4TP33	C-34
4TP36	C-37
4TP43	C-37
4TP44	C-39

Figure S-78. Radar ranging system functional schematic diagram (sheet 6 of 6).

NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTANCE IS IN OHMS, CAPACITANCE IS IN MICROFARADS.
2. ALL DIODES 1N4003 UNLESS OTHERWISE SPECIFIED.
3. ALL TRANSISTORS 2N2222A UNLESS OTHERWISE SPECIFIED.
4. POLARITY DATA AND CONVENTIONS.
   - A: MOTORS ARE VIEWED FROM THE BRAKE END
   - B: POTS AND TACH ARE VIEWED FROM SHAFT END
   - C: POSITIVE ON AMP GIVES OUTPUT ON 1
   - D: TACH POLARITY AS MARKED WHEN DRIVEN CCW
   - E: CW POT ROTATION GROUND NO. 1 TERMINAL
   - F: CW AND CCW REFER TO POTS, TACHS, AND MOTORS
   - G: RIGHT, LEFT, UP AND DOWN REFER TO GUN
5. ALL SWITCHES ARE SHOWN IN THE UNACTUATED STATE UNLESS OTHERWISE SPECIFIED.
6. ALL RELAY CONTACTS ARE SHOWN WITH THE COIL DE-ENERGIZED.
7. THE FOLLOWING SYMBOLS AND THE APPLICABLE PIN LETTER IS USED TO DEFINE TEST POINTS.
   - CONTROL PANEL
   - DISTRIBUTION BOX
   - SIGHT CURRENT GENERATOR
8. TAP IS MOVED TO 10.1 VOLTS AT OR BELOW 32°F
9. FIVE POSITION ROTARY SWITCH WITH HI RATE CONTACTS CLOSED IN ALL HI RATE-BURST LIMIT POSITIONS.
10. POSITIVE LEAD ANGLE WHEN GUN IS ABOVE LINE OF SIGHT FOR INCOMING TARGETS.
11. LIGHT BLINKS WHEN SYSTEM VOLTAGE DROPS BELOW 22 VDC AND REMAINS ON WHEN SYSTEM VOLTAGE DROPS BELOW 20.5 VDC AND K2 DE-ENERGIZES PLACING SYSTEM INTO GROUND MODE WHEN S8 IS SET IN "NORMAL" POSITION.
12. NON-FUNCTIONING CIRCUITRY RETAINED FOR INTERCHANGEABILITY REASONS.

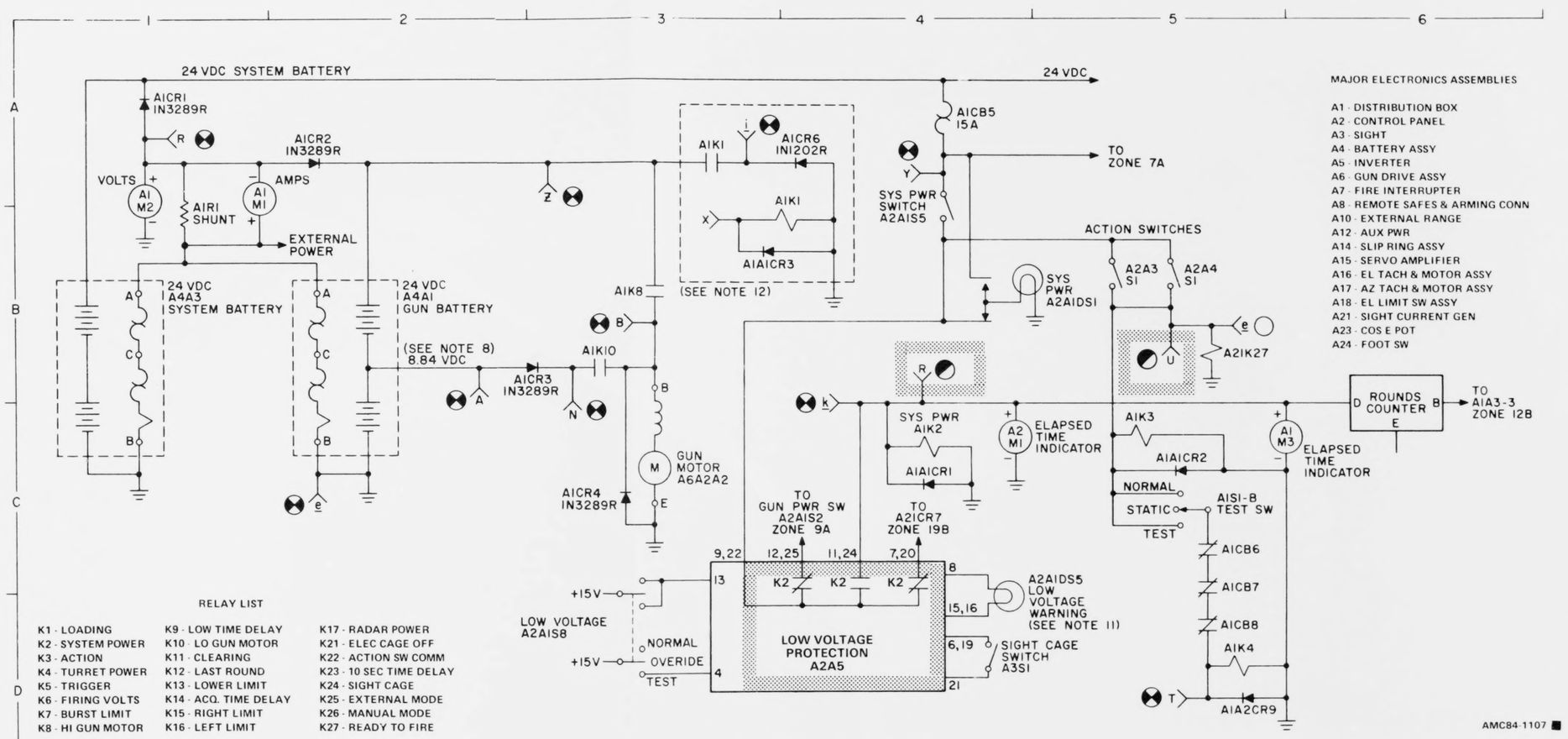
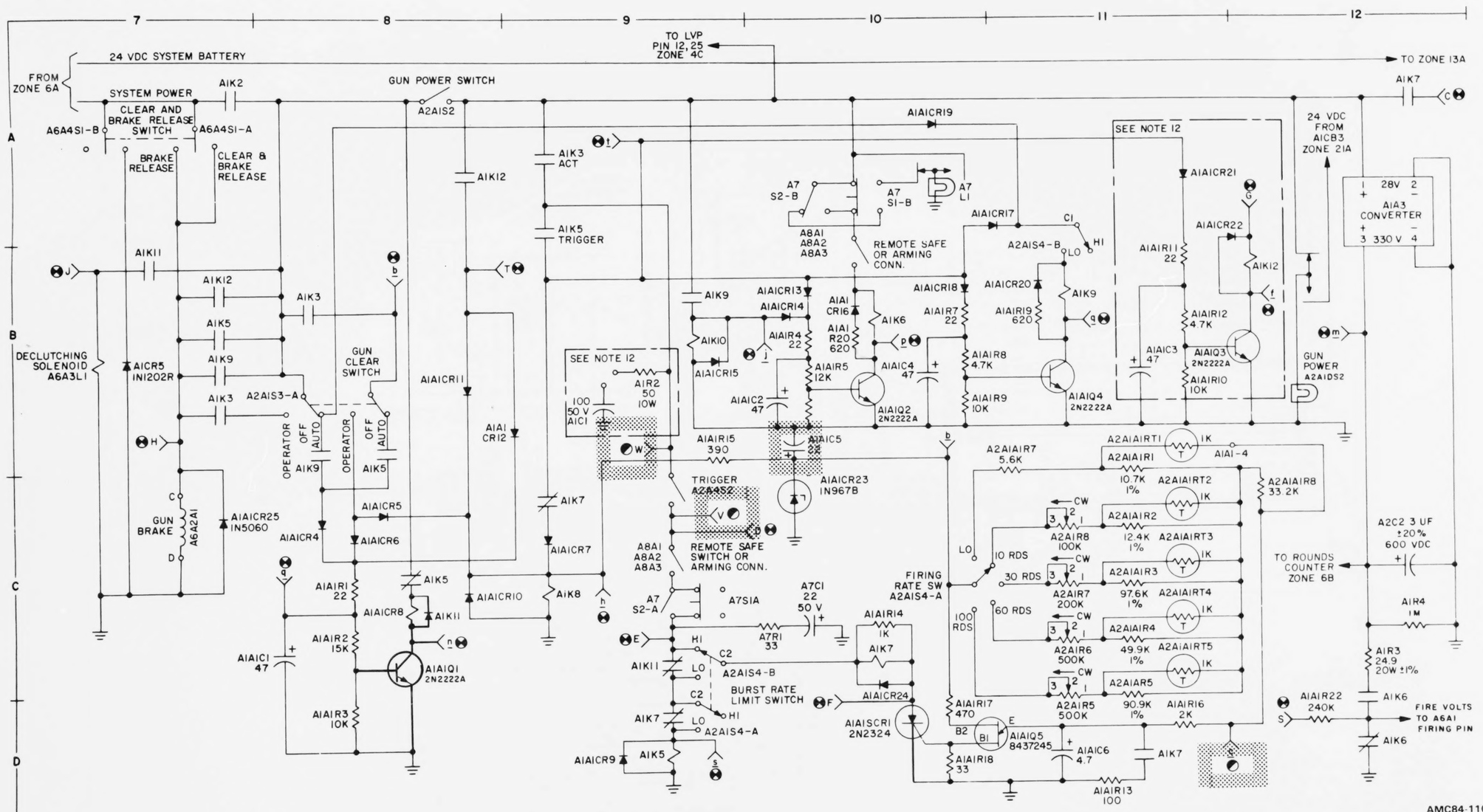
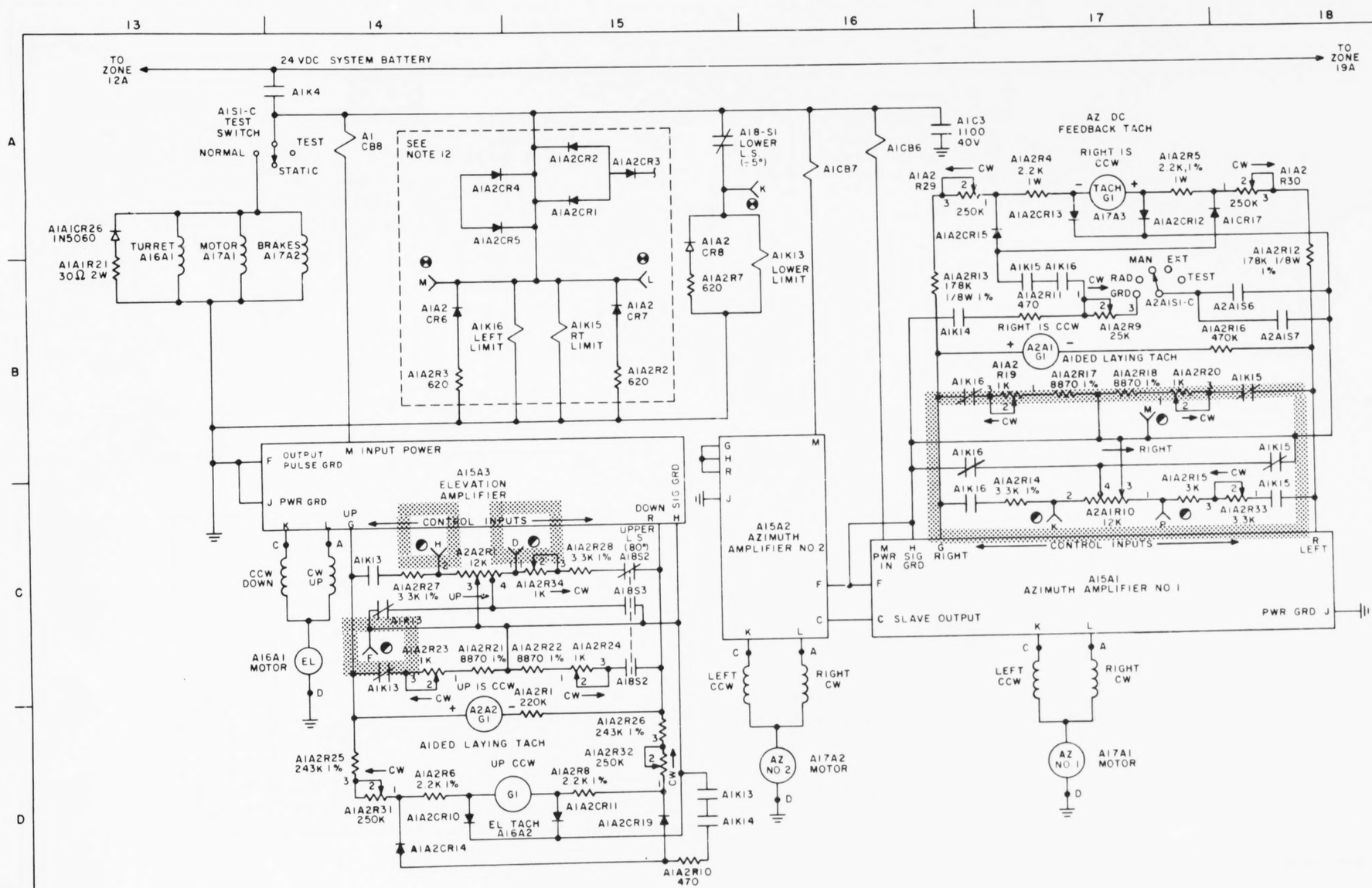


Figure 5-79. M167A1 system electrical schematic diagram (sheet 1 of 5).



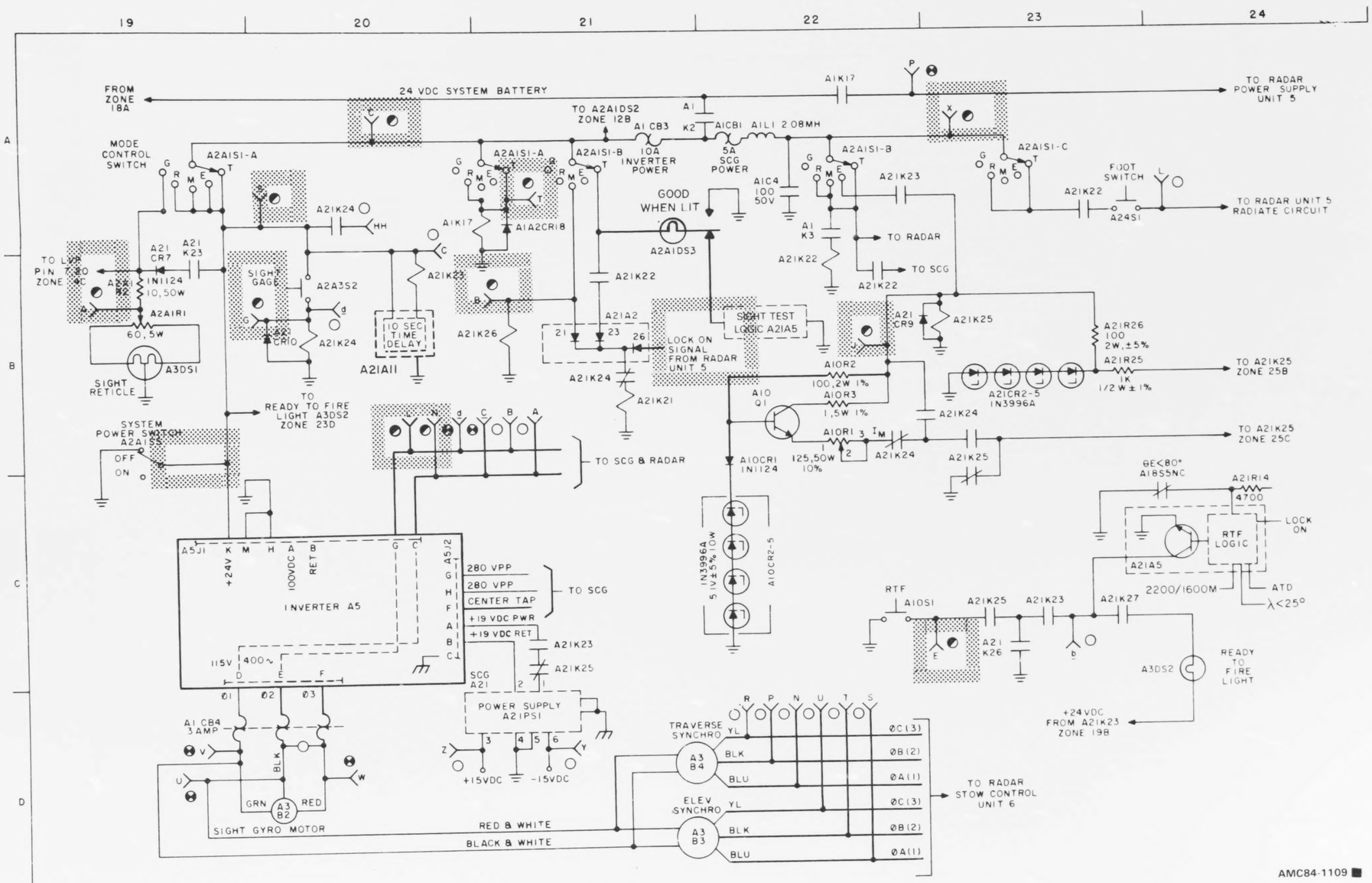
AMC84-1108

Figure S-79. M167A1 system electrical schematic diagram (sheet 2 of 5).



AMC84-1130 ■

Figure S-79. M167A1 system electrical schematic diagram (sheet 3 of 5).


19
20
21
22
23
24
FROM ZONE 18A
24 VDC SYSTEM BATTERY
TO A2A1DS2 ZONE 12B
A1CB3
A1K17
TO RADAR POWER SUPPLY UNIT 5
A1CB1 A1L1 2.08MH
10A INVERTER POWER
5A SCG POWER
A1C4 100 50V
MODE CONTROL SWITCH
A2A1S1-A
A2A1S1-B
A2A1S1-C
A2A1DS3
GOOD WHEN LIT
A2A1S1-A
A2A1S1-B
A2A1S1-C
A2A1K24
A2A1K23
A2A1K22
A1K3
FOOT SWITCH
A24S1
TO RADAR UNIT 5 RADIATE CIRCUIT
TO RADAR
TO SCG
A1K17
A1A2CR18
A2A1K22
A2A1K23
A2A1K22
A2A1K26
A2A1K24
A2A1K21
A2A1A2
SIGHT TEST LOGIC A2A1A5
LOCK ON SIGNAL FROM RADAR UNIT 5
A2A1CR9
A2A1K25
A2A1R26 100 2W, ±5%
A2A1R25 1K 1/2W ± 1%
TO A2A1K25 ZONE 25B
A2A1CR2-5 1N3996A
TO A2A1K25 ZONE 25C
A2A1K24
A2A1K25
A1Q1
A1R2 100,2W 1%
A1R3 1,5W 1%
A1R1 3 1/2 125,50W 10%
A1CR1 1N1124
IN3996A 5.1V ± 5% 10W
A1CR2-5
TO A2A1K25 ZONE 25C
TO A2A1K24 ZONE 25B
TO A2A1K23 ZONE 19B
TO A2A1K22 ZONE 19B
TO A2A1K21 ZONE 19B
TO A2A1K26 ZONE 19B
TO A2A1K27 ZONE 19B
TO A2A1K25 ZONE 25B

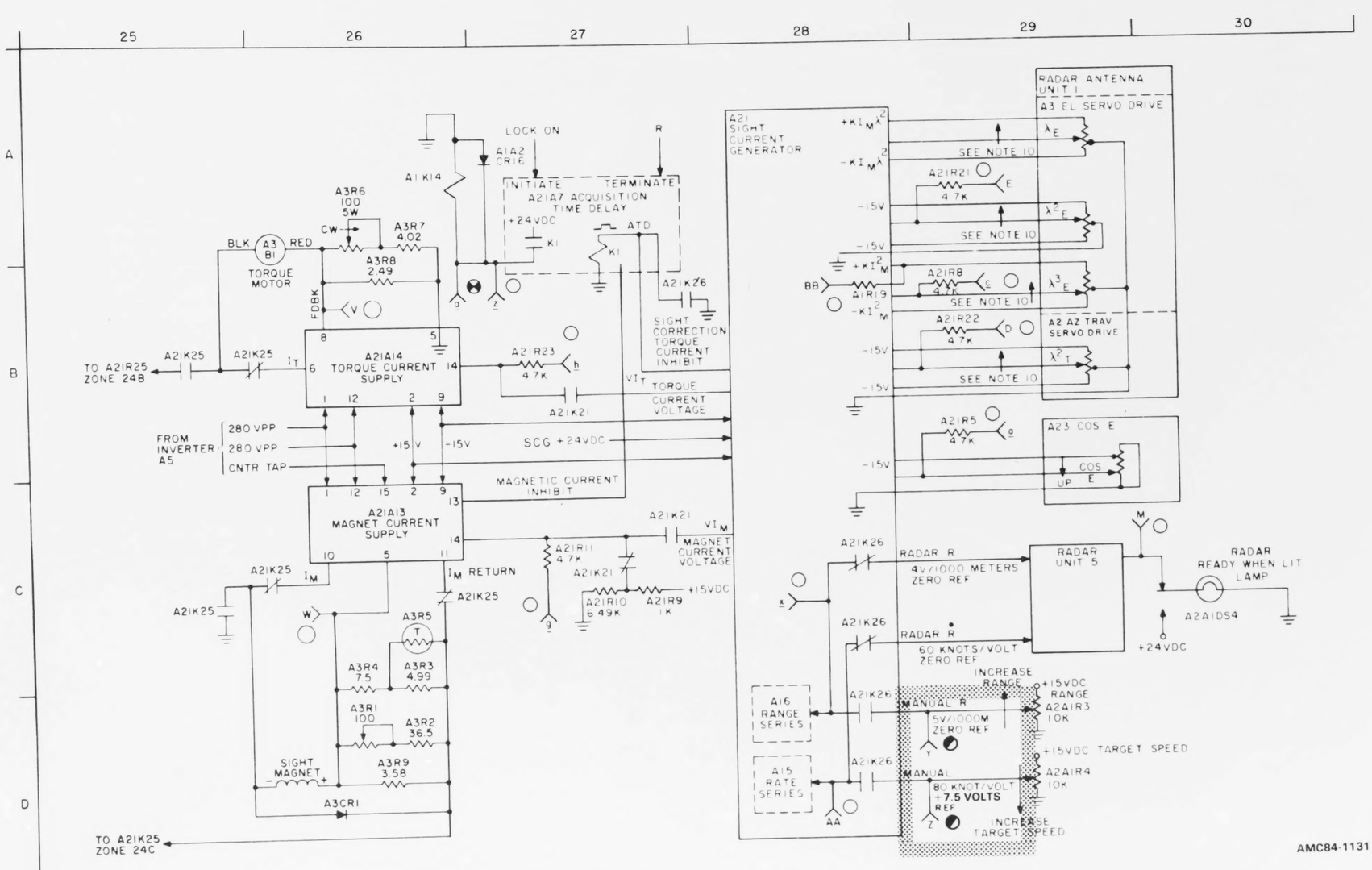
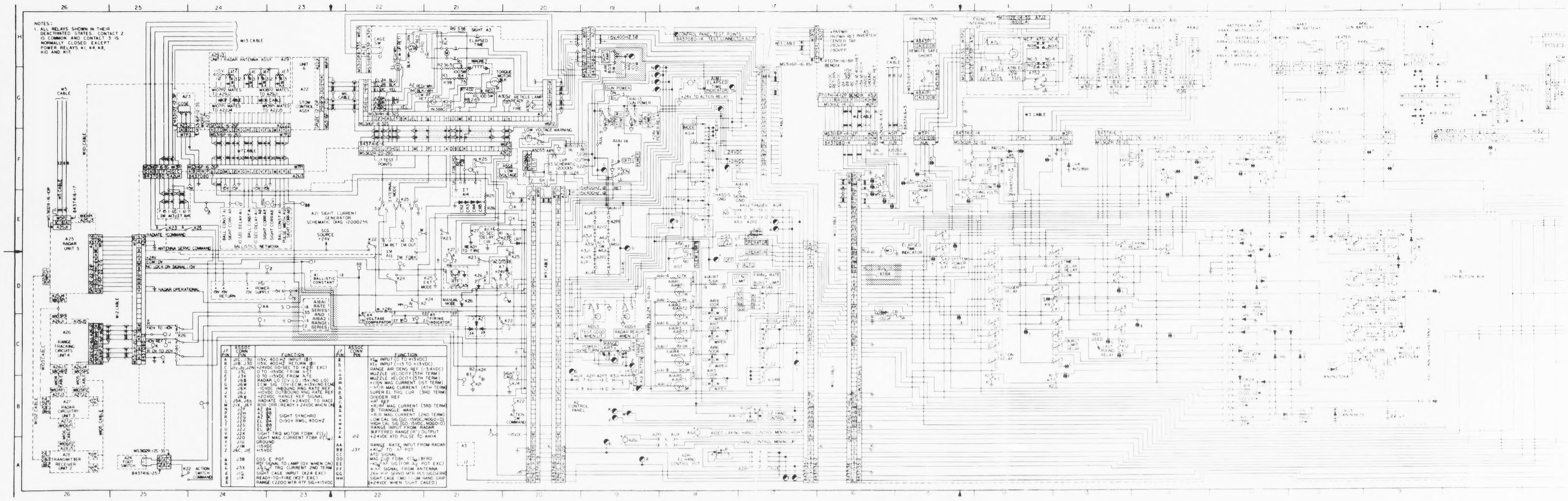


Figure S-79. M167A1 system electrical schematic diagram (sheet 5 of 5).


NOTES:
1. ALL RELAYS SHOWN IN THEIR DEACTIVATED STATES. CONTACT 2 IS COMMON AND CONTACT 3 IS NORMALLY CLOSED EXCEPT POWER RELAYS K1, K4, K8, K10 AND K17.
W5 CABLE
W3 CABLE
W4 CABLE
A25 RADAR UNIT 5
A26 RANGE TRACKING CIRCUITRY UNIT 4
A27 AZ/EL MOTOR UNIT 3
A28 TRANSMITTER RECEIVER UNIT 2
A24 FOOT SWITCH
A22 STOW CONTROL ASSY
A21 SIGHT CURRENT GENERATOR SCHEMATIC DRAG 12000216
A3 SIGHT ELEVATED TIME
A1 CONTROL PANEL TEST POINT 8437080-4 TEST PANEL
A1A1 I/O
A1A2 CPU
A1A3 MEMORY
A1A4 POWER SUPPLY
A1A5 TEST LOGIC
A1A6 RADAR READY
A1A7 ARBITRATION
A1A8 HASSS UNIT
A1A9 AZ/EL RESOLVER
A1A10 AZ/EL SERVO
A1A11 AZ/EL RATE
A1A12 AZ/EL MOTOR
A1A13 AZ/EL SERVO
A1A14 AIM/FIRE
A1A15 AZ/EL SERVO
A1A16 AZ/EL SERVO
A1A17 AZ/EL SERVO
A1A18 AZ/EL SERVO
A1A19 AZ/EL SERVO
A1A20 AZ/EL SERVO
A1A21 AZ/EL SERVO
A1A22 AZ/EL SERVO
A1A23 AZ/EL SERVO
A1A24 AZ/EL SERVO
A1A25 AZ/EL SERVO
A1A26 AZ/EL SERVO
A1A27 AZ/EL SERVO

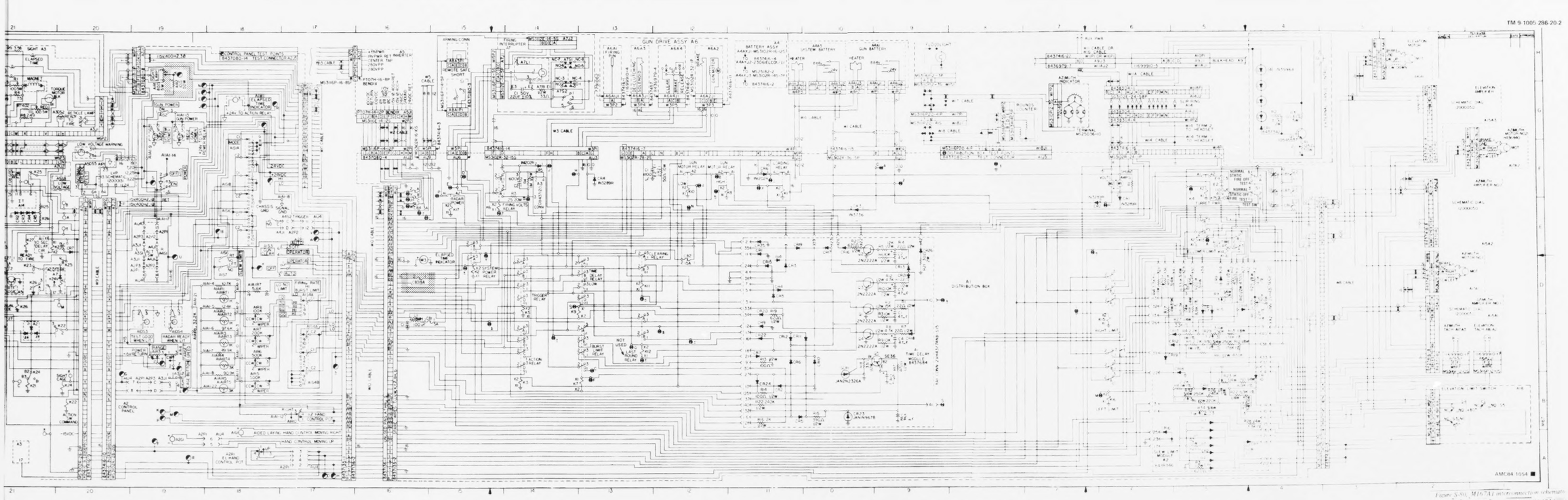


Figure 5-50. M60A1 interconnection schematic.

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

PAUL T. SMITH
Major General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-40 (qty rqr block no. 169) Organizational maintenance requirements for Gun, Air Defense Artillery, M167, M167A1.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1990 O - 278-727

PIN : 026413-000